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ABSTRACT

This study investigates the role of several important factors in terms of their influence on the supply of married women in Canada's labor force. The factors include income, child status, region of residence, family, holdings of assets and debts, labor force status of the husband, presence of other adults in the family, and residence in a metropolitan area. The data were obtained from a survey taken in April and May of 1964, and included 6,401 returns from non-farm families and unattached individuals. Some findings were: (1) Married women are less likely to be in the labor force as their level of family income goes up, (2) The presence of a pre-school child is a very strong deterrent to the mother's labor force participation, (3) For the youngest group of married women the region of residence is not a significant influence, but for older women it becomes increasingly significant, and (4) A wife is much more likely to be in the labor force if the husband is unemployed than if he is employed. (GEB)

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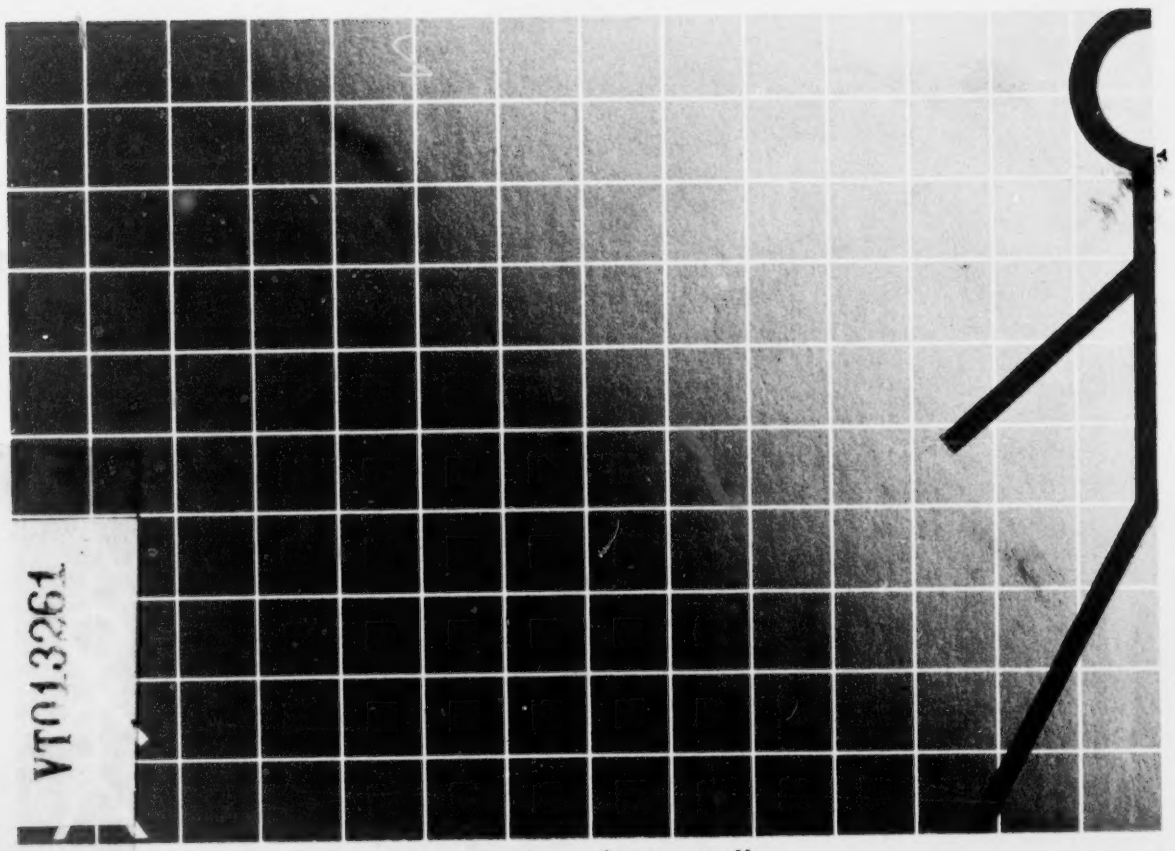

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SPECIAL LABOUR FORCE STUDIES

Series B, No. 4

MARRIED FEMALE LABOUR FORCE PARTICIPATION: A MICRO STUDY

by

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and

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Econometric Research
Dominion Bureau of Statistics

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A Micro Study

ERRATA

Page 1

"Price: 50 cents" should read "Price: 75 cents".

Page 61

Table 15. In the colum headed "All ages", opposite the entry "All children less than 6 years ...", the number "-.200" should read "-.200[1]".

Page 71

Table 18. In the column headed "65 and over" opposite the entry "Prairie Provinces" the number "1.4 should read "1.1".

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FOREWORD

In 1966 the Special Labour Force Studies programme of publications was initiated by the Dominion Bureau of Statistics. These research studies were designed to reach a broad audience interested in the changing nature and composition of the Canadian labour market. Some aspects of manpower development, however, require a somewhat more technical approach. For this reason, the present series (B), of which this is the fourth study, will be published as a companion series of technical papers.

This study was initiated under the direction of Dr. Sylvia Ostry who, until recently, was Director, Special Manpower Studies and Consultation, and was completed after Mrs. Helen Buckley assumed responsibility as Chief, Special Manpower Research Section, Regional and Manpower Research Staff.

The responsibility for the analysis and interpretation of the data is that of the authors and not of the Dominion Bureau of Statistics.

WALTER E. DUFFETT,
Dominion Statistician.

PREFACE

In the course of a study which extends over a period of two and one-half years one incurs many debts. We would particularly like to thank Frank T. Denton and Sylvia Ostry who, before we became involved, undertook some preliminary analysis of the data on which our study is based. Dr. Ostry assumed responsibility for the overall direction of the study, even following her departure from the Bureau. We are grateful for her advice, consultation, and support at many stages. Professor Denton was always available to discuss the innumerable problems associated with an econometric study, to provide encouragement, and to remind us that a cut-off date was warranted. Mrs. Gail Oja, Chief, Research and Analysis, Consumer Finance Research Staff, Dominion Bureau of Statistics, read the manuscript carefully and helped us to avoid several errors in the interpretation of the data.

In the typing of the manuscript we are indebted to Miss Helen Schreiner who miraculously turned hand-written pages bordering on the illegible into things of near beauty, and to Miss Linda Kisslinger, and Mrs. Marilyn Walker, who typed the final copy. For research assistance we are indebted to Mr. James A. Smith, who volunteered much of his time and energies, and to Mrs. Margaret Derrah.

Finally we wish to thank our wives who continue to provide us with convenient case studies of why women do (Flora) and do not (Brenda) work.

Byron G. Spencer.

February 1970. Dennis C. Featherstone.

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I. INTRODUCTION

Social custom provides the Canadian male with a fairly clearcut pattern for his adult working life, while it provides his female counterpart with a complex variety of alternatives and taboos. It is possible to generalize the male's situation: having left the educational stream and motivated by some combination of such necessities as food, shelter, family support and the personal satisfaction of achievement, a man will either be working or seeking employment. For females the decision to participate in the labour force is considerably less automatic. Some women work for the same reasons that apply to the male—for example, most single women, as well as many divorced, separated, widowed, or student-husbanded women will work as providers, and, wherever possible, for the satisfaction derived from personal achievement in their work. But what of married women whose husbands are present and typically working? Their participation or non-participation in the labour force depends on a more complex set of considerations including constant moral and practical problems. The once-firm rule that "the woman's place is home" has been modified, so that it is more likely to read". . . the woman's place is in the home if she has small children and strong compunction to stay with these children, or if she lacks good substitute care for the children". The wife without small children may find "confinement to quarters" unbearable particularly if she lives in an impersonal high-rise building in a large city. Alternatives to "the home" include involvement in a variety of community and charity organizations, a return to the educational system, or a job. The relative attractiveness of being in the labour force is likely to hinge on the opportunity cost of labour force participation—that is, how much income is foregone by withholding services—the "need" for additional income, judged in the light of current and anticipated family circumstances, and the personal satisfaction derived from the job.

Historical Background

During the period for which records exist, women have steadily increased the extent of their labour force participation. More complete data are available for females in general rather than married ones in particular; however, such data as exist point to some sharp differences in the patterns of their labour force participation.

In Table 1 are recorded some measures obtained from the decennial censuses, starting in 1931. There is a clear upward trend in the extent to which married women are in the labour force. Only 3.5 per cent of married women were in the labour force in 1931. By 1951 the figure had more than trebled, and by 1961 it had increased more than six-fold, reaching 22.0 per

cent. Furthermore, the married women formed an increasing portion of the total female labour force during this period: in 1931 married women accounted for only one female worker in ten; by 1961 she accounted for almost five in ten.

Table 2 records similar statistics annually for the period 1959 to 1969. The aggregate participation rate of all women has increased steadily from 26.7 to 35.2 per cent, or by 8.5 percentage points during the decade. It is clear from the "married", and "single", and "other" categories that the increase in the total has occurred primarily as a result of the steady rise in the labour force participation of married women, which increased from 18.0 per cent to 31.2 per cent or by 13.2 percentage points in the decade. During the same period the proportion of married women in the female labour force grew from 44 per cent to 56 per cent. Part of the growth is no doubt attributable to the reduction in the average age at the time of marriage, but the bulk of the increase is probably in line with the general and marked trend for married women to be in labour force.[1]

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[1] The 1961 figures in the two tables are not directly comparable since Table 1 reports the mid-year 1961 Census estimate while Table 2 reports the annual average. See also Tables 5 and 6 below.

TABLE 1. Female Labour Force Participation, Census Years 1931-61[1]

Year	Participation rate				Married women to total women in labour force
	Married	Single	Other	Total	
	per cent				
1931	3.5	43.8	21.3	19.3	10.0
1941	4.5	47.2	17.3	20.3	12.7
1951	11.2	58.3	19.3	24.1	30.0
1961	22.0	54.1	22.9	29.5	49.8

[1] Statistics from the 1931 Census are for the age group 10 and over. Statistics from the 1931-51 Censuses are for the age group 14 and over. Statistics from the 1961 Census are for the age group 15 and over. Figures exclude those on active military service; Newfoundland is included from 1951 on; the Yukon and Northwest Territories are not included.

Sources: DBS, 1961 Census, Advance Report N. AL-1 (Catalogue No. 94-500), Table 2. DBS, 1931 Census Vol. VII, Table 55, Table 26.

TABLE 2. Female Labour Force Participation, 1959-69, Annual Averages

Year	Participation rate				Married women to total women in labour force
	Married	Single	Other	Total	
	per cent				
1959	18.0	51.6	25.8	26.7	44.4
1960	19.2	52.4	27.4	28.0	45.0
1961	20.8	51.4	27.4	28.8	47.3
1962	21.6	50.5	26.9	29.1	48.4
1963	22.6	49.1	27.7	29.6	49.7
1964	24.1	48.3	27.9	30.5	51.1
1965	25.2	48.7	27.6	31.3	51.7
1966	26.8	49.7	28.0	32.8	52.1
1967	28.3	49.6	28.9	33.8	53.3
1968	29.6	48.7	28.4	34.4	54.7
1969	31.2	48.6	27.4	35.2	55.8

Source: DBS, Special Surveys Division, Mimeographed publication 9603-101.

While the labour force participation of married women in Canada and elsewhere has increased dramatically over the last few decades, the labour force participation of men, especially those in their prime working years (from 25 to 55) has remained steady at a figure just short of 100 per cent. Men, especially in the prime age groups, have a very strong attachment to the labour force: if they are able-bodied, the dictate of society is that once educated, they should be working. All other groups in the labour force have a rather weaker or more "marginal" attachment. All of these marginal members of the labour force are, by definition, willing to choose to work or not to work as the circumstances change. For example, "older" men, even including those 55-65, have reduced somewhat the extent of their labour force participation, and chosen an earlier retirement instead. Younger people have opted to stay longer in the educational process, and hence enter the labour force later. And, married women have increasingly, and to a greater extent than other marginal workers, opted to increase the extent of their labour force participation. The comparison is, again, with prime age males for whom the choice really does not exist: the range of circumstances which we have experienced in recent history has not altered in a noticeable way the proportion of their numbers who are either working

or seeking work.[2] For the marginal workers, however, the changes have been significant, and have apparently affected substantially their involvement in the labour force.

It is the purpose of this study to investigate the role of several important factors in terms of their influence on the supply of married women in Canada's labour force. We proceed first to provide a framework for the analysis of the determinants of their labour force participation, and to summarize the current state of knowledge on this subject. We then describe the national survey on which the current study is based and finally present an analysis of that survey.

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[2] This is not to say that important changes have not occurred with respect to the labour force participation of prime-age males. In particular the average number of hours worked per week has declined steadily for many decades.

II. FRAMEWORK FOR THE ANALYSIS: IMPORTANT FACTORS

We are interested to learn the importance, both relative and absolute, which a wide variety of factors have on the labour force behaviour of married women. Under what circumstances or combination of circumstances is she likely to be in the labour force, and under what circumstances not? The various factors or circumstances which we reason are likely to have some impact we designate the **determinants** of the labour force behaviour of the wife. Thus, for example, one might argue that the level of family income is one of the factors or circumstances which a married woman takes into account when she considers being a member of the labour force. If so, then one argues that income is a **determinant** of whether or not she goes to work. Presumably the higher the level of family income when she is not working, the less likely she is to work. We can, therefore, hypothesize not only that income is a factor which is likely to be taken into consideration, but we have a clear idea of the general nature of the impact.

We start our analysis by listing and discussing the entire range of factors which are likely to be important determinants of the wife's labour force behaviour.

A. Income

Family Income

We have suggested that the higher the level of income available to the family if the wife does not work, the less likely she is to seek employment. The statement seems very plausible, and our subsequent analysis indicates that it has much relevance. It is useful, however, to consider a number of qualifying factors.

Is it the family's **current** income position which is relevant, or its **permanent** income?[3] In any one month or year a family's income may diverge a good deal from its "norm". If so, will the wife, in considering her labour force behaviour, be influenced by the current income level, by the extent of the discrepancy between it and the norm, or by the norm itself – or by all three? As in so many cases the answer is not obvious. Yet the matter is of considerable importance. For example, the young, well-educated husband will earn much less at twenty-five than he will in five or ten years. During this period when the family income is below its "norm"

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[3] The concept of "permanent income" originated with Milton Friedman, who defines it as "the amount a consumer unit could consume (or believes that it could) while maintaining its wealth intact". Milton Friedman, *A Theory of the Consumption Function*, (Princeton: 1957), p. 221. Jacob Mincer makes use of the concept in "Labour Force Participation of Married Women: A Study of Labour Supply", in *Aspects of Labour Economics*, (Princeton: 1962), pp. 69 and following.

the wife may well wish to supplement it in order that the family can enjoy currently the level of consumption which it expects to attain in a few years on the basis of the husband's income alone.

Potential Income of Wife

Of obvious importance is the amount which the wife could contribute to the family income if she were to go to work – her potential income. For wives not already working full time it is impossible to predict potential earnings accurately. But the extent of her formal education would be a good indicator.

Against what she could earn in the labour force one must consider the non-market contribution which she is making at home – her "home wage". By its very nature this is a difficult figure to ascertain. Perhaps three concrete bits of information could provide some indication. First, and most important, is whether or not there are children, and particularly young children, in the family. If there are children her value at home includes all the psychological benefits to the child that are associated with the mother's being at home plus the obvious costs which would be incurred to provide some sort of child care as a substitute for the mother.

A second indication is whether the family lives in rented quarters or in a home which it owns. Typically a wife would have fewer home responsibilities in the former case, and would, therefore, be more free to go to work.

A third indication, whose potential impact is perhaps less obvious, is the presence in the family of an adult other than the head and his wife. On the one hand, the presence of a third adult might provide built-in-child care services which would free the mother to go to work. On the other hand, that other adult may also be dependent and as demanding of the mother's time and attention as a young child. Clearly particular circumstances will determine which is the case. On an aggregated level we shall be able to see which effect appears to dominate.

B. Security of Income Stream

A family in a particular income position and fully confident that its income will continue at about the same level is in a substantially different position from a family with the same current income but much less certainty regarding future income. In the latter case the wife is more likely to go to work in order to reduce somewhat the uncertainty, and to assure a source of income.

Closely related to the assurance of an income stream is the family's stock of financial securities. A family with a stock of assets, especially liquid assets which could readily be turned into cash (e.g., Canada Savings Bonds), could survive a period when the income of the head is cut back or even temporarily eliminated until new employment is found. While a family unable to run down its financial assets may be able to obtain a bank loan, the cost could be high and the risk substantial in such circumstances. Thus we hypothesize that, other things equal, the smaller the available stock of financial assets the more likely the wife is to go to work in order to provide additional income security.

Conversely, with respect to the family's stock of debts: the greater the volume of debts (personal loans, mortgages, etc.) which the family has incurred the more likely is the wife to go to work.[4]

In addition we know whether the family owns the place in which it lives. It was suggested above that this information could serve as an indicator of the wife's home wage. However it could also serve as a measure of the family's assets. If the fact of home ownership is deemed a proxy for the family's wealth position then one could hypothesize that the greater the family's stock of wealth the less likely is the wife to be in the labour force. However, we are able to take directly into account the family's asset position without relying on such a proxy variable. Hence if we find a significant independent role for the home ownership variable it would suggest only that the fact of home ownership has an influence on the wife's home wage independent of the several other indicators also employed.

Another observable dimension of the income security of the family is the employment status of the husband. If the husband tends to be unemployed periodically the wife will have an incentive to even out the family's income stream by going to work. At what is perhaps the other end of the spectrum, if a man is self employed he is very unlikely to find himself unemployed. His job security is nearly complete and his wife need not work to provide the "stop-gap". Of course, job security is distinct from security of the income stream; the wife is still likely to be in the labour force if her husband's income varies greatly from year to year.

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[4] There remains a question regarding the direction of the causation in the cases mentioned above. For example, it is possible that a wife will go to work not because the family has certain debts, but rather in order to permit the family to incur such debts. We comment on this point subsequently. In the meantime we note that our empirical work in general supports the hypotheses in the text.

C. Tastes for Work

The consensus of opinion on such socially sensitive matters as the labour force participation of married women changes over time, and to some extent, differs at a point of time from one centre to another. The "taste for work" is a complex phenomenon having many dimensions and, as we indicated before, it depends not only on what the wife herself may think, but also what her husband, children, and neighbours might think. Most of these factors are not very readily quantifiable. Some aspects, however, are. We may investigate, for example, the extent to which tastes appear to vary from one part of the country to another, between metropolitan and non-metropolitan centres, and among various age groups.

D. Random Factors

In addition to all the factors which we have discussed there are innumerable factors which an individual wife will wish to take into account. Many of the factors will be specific to her, and hence not of general interest. Some of these factors will favour her labour force entry, others dictate against it.

To the extent that the factors which we have discussed above are the major ones of general applicability – and we believe them to be – other factors can be viewed as typically specific to individual cases, and affecting the labour force behaviour of married women at large in an offsetting way.

E. Summary of the Determinants

In its most general form we may summarize the foregoing by stating our hypotheses as follows: the labour force behaviour of the married woman, is, in significant measure, explained by, or a function of, the above several determinants. In order to make the discussion more concise and explicit we assign symbols to each of the several determinants, as noted in Table 3. Using the symbols we can state our formulation in terms of a single equation:

$$P_i = f\,(Y_f\text{-}W,\ Y^p_w - Y^h_w,\ \text{Fin Sec},\ \text{Taste},\ U)$$

The above equation simply states that the probability that a married woman will be in the labour force is related to and partially explained by each of the several variables on the right-hand side.

TABLE 3. The Determinants of Labour Force Participation: Symbols, Definitions, and Some Indicators

Symbol	Definition	Some indicators
P_i	Labour force participation of wife, the probability that a married women will be in the labour force.	Proportion of married women in the labour force
$Y-W_f$	Income of the family, excluding the earnings of the wife.	Current income Expectations of future income
Y_w^p	Potential earnings of the wife.	Education
Y_w^h	Home wages of the wife.	Child status Home ownership Presence of other adults in home
Fin Sec	Financial security: holdings of assets and debts.	Bank deposits Bonds Mortgages Personal debts Equity in real estate Employment status of husband
Taste	Taste for work.	Regional variations Urban-rural discrepancies
U	Ramdom, unexplained factors.	None

III. REVIEW OF PREVIOUS CANADIAN STUDIES

Four analyses of Canadian data have been published which investigate the differentials in the labour force behaviour of women of varying marital status, age, and other characteristics. Each of these studies has paid especial attention to the case of married women.[5] In addition several publications providing background information have appeared,[6] conferences have been held on the problems encountered by the working woman and especially the working mother,[7] and a Royal Commission has been appointed to investigate her situation even more thoroughly. Having reviewed briefly the historical background of the changing pattern of the labour force behaviour of married women, and provided a framework for the discussion, we now review previous analyses in order to put into proper perspective our own study.[8]

The Allingham, Allingham and Spencer, and Ostry studies have analysed 1961 Census Data, and considered and evaluated the importance of several factors which one would expect would have a major bearing on whether or not a married woman would work. In total they have attempted to quantify the absolute and relative importance of age, education, residence child status, and the income of the husband for married women. Thus these studies, taken together, have considered many of the various indicators of the several determinants of the labour force participation of the married woman which we outlined in our framework for analysis, in Part 3.

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[5] Dominion Bureau of Statistics, Special Labour Force Studies, No. 5, *Women Who Work: Part 1, The Relative Importance of Age, Education, and Marital Status for Participation in the Labour Force*, by John D. Allingham, (Ottawa: Queen's Printer, 1967).

Dominion Bureau of Statistics, Special Labour Force Studies, Series B, No. 1, *The Demographic Background to Change in the Numbers and Composition of Female Wage-Earners in Canada, 1951 to 1961*, by John D. Allingham, (Ottawa: Queen's Printer, 1967).

Dominion Bureau of Statistics, Special Labour Force Studies, Series B, No. 2, *Women Who Work: Part 2, Married Women in the Labour Force: The Influence of Age, Education, Child-Bearing Status, and Residence*, by John D. Allingham and Byron G. Spencer, (Ottawa: Queen's Printer, 1968).

The Female Worker in Canada, 1961 Census Monograph, by Sylvia Ostry, (Ottawa: Queen's Printer, 1968).

[6] For example, the *Women's Bureau Bulletin*, published occasionally by the Canada Department of Labour; *Women at Work in Canada*, (Ottawa: Queen's Printer, 1964, and previous volumes); *Women in the Public Service, Their Utilisation and Employment*, by Stanislaw Judek, (Ottawa: Queen's Printer, 1968); and *Maternity Leave Policies, A Survey*, Canada Department of Labour, (Ottawa: Queen's Printer 1969).

[7] See, for example, Canada Department of Labour, *Report of a Consultation on the Employment of Women with Family Responsibilities*, (Ottawa: Queen's Printer, 1965).

[8] In addition several studies which use U.S. data have appeared. See, for example, items 5, 10 and 24, Appendix D.

In Table 4, we present a summary of the various factors which are likely to be important as determinants of the labour force participation of married women, and whose importance has been investigated in at least one of the three studies mentioned. We consider the three in chronological sequence of publication since they have, to an extent, built one upon another.

The first study is that by John D. Allingham. As the title suggests, it is not concerned solely with the labour force participation of married women, but rather with female participation in general. By tabulating the participation rates of women in all marital status groups while controlling for the level of education it appears that the level of education has an independent impact on participation rates: for every age and marital status group the participation rate is higher the more highly educated the woman. Similarly, the participation rates of every age and education group are higher for single women than for those widowed and divorced, and lowest for married women. By comparing the magnitudes of the participation rate differentials in each of these cases Allingham concludes that, in order of their importance, marital status, education and age of the woman have significant impacts on the likelihood that she will be a participant in the labour force. For married women in particular, the primary conclusion of the Allingham study was that the education of the married woman is a much more important factor in explaining her labour force participation than is her age.

The Allingham study was admittedly preliminary since it was not able to consider explicitly the impact of such factors as income and child status. To an extent these shortcomings were corrected in the study by Allingham and Spencer, which was intended solely to investigate the absolute and relative importance of several factors as they affected the labour force participation of married women. Again the source of data was the 1961 Census.

In the Allingham and Spencer study it was possible to investigate the importance not only of the age and education of the wife, but also her child status, her residence (the size of the community in which she lived), and the education of her husband (which served as an imprecise indicator of his current and potential earning abilities). The technique of analysis changed from reliance on the cross-tabulations of the Allingham study to multiple regression analysis with which it is possible to investigate the impact of several factors simultaneously.

The analysis supported and extended earlier work by demonstrating the rather insignificant role played by age along in determining the labour force participation of the wife, and by showing the substantial importance

of the other factors not investigated previously. In particular, it is shown that for the youngest age groups of married women (those 15-24, 25-34, and 35-44) the presence of children is the most important factor, and her education is second. For "older" women (those 45-54 and 55-64) the education of the wife becomes the single most important factor, her husband's education (income?) second, and child status and residence compete for relatively insignificant roles. The same conclusions are broadly supported if one considers each of the residence groupings separately.

Finally, we turn to the Ostry Census monograph which pays particular attention to the investigation of the determinants of the labour force participation of married women, though it has a much broader scope. In the text of the study are many highly suggestive cross tabulations of the labour force participation rates of married women. They control for a variety of factors, including age, education, child status, and income of husband. In addition there is an appendix in which the data is analysed using both analysis of variance and multiple regression analysis techniques. In the appendix the several determinants listed in Table 4, Column 3, are considered simultaneously in two separate regression analyses, the first of which controls for the age of the wife but not for her education, and the second of which controls for her education but not her age.[9]

The Ostry study confirms previous results, and provides new information by having an improved child status variable and a regional variable. The importance of the child status factor is amply indicated, and particularly its declining relative importance for older groups of women. The income of the husband proves to be a more important factor than his education (used as a proxy for his income in the Allingham-Spencer study) in determining the labour force participation of his wife. Indeed, while neglecting the influence which the wife's education may have, the income of of the husband becomes the single most important variable in explaining the labour force participation of the married woman in the age group 45 -64.[10]

One striking new result is an improved indication of the importance and extent of regional differences. Even after taking into consideration income, child status, age, and urban-rural factors, a substantial amount of explanatory power is left with the regional influence, for all age groups combined and for each separately. In fact, a clear pattern is apparent: married women of all ages in the Atlantic provinces and Quebec, are markedly less likely to be in the labour force than are women in Ontario,

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[9] As we shall see the first set of regressions can be compared to the current work. See Chapter VI.

[10] See, Ostry, *op. cit.*, p. 56.

the Prairie provinces, and British Columbia.[11] Similar conclusions appear warranted when the age factor is neglected and the education level of the wife is taken into account.[12]

By comparison, in the current study, (with one exception), we are able to include in our analysis all the determinants of the labour force participation of married women which have previously been investigated using Canadian data. The one important exception is the education of the wife.

In addition, however, we are able to provide a measure of the relative and absolute importance of several types of asset and debt holdings of the the family, of the importance of the current employment status of the husband, and of the presence of adults other than the husband and wife in the family unit.

But before we can proceed to a report and analysis of the current results we must pause to consider the sample survey on which the study is based and the nature of the data which are avaialble.

[11] *Ibid.*
[12] *Ibid.*, pp. 57-8, Table A4.

TABLE 4. Factors Analysed in Studies of the Labour Force Participation of Married Women in Canada

Factor	Study		
	Allingham	Allingham and Spencer	Ostry
Age of wife	15-24 years 25-34 " 35-44 " 45-54 " 55-64 " All ages	15-24 years 25-34 " 35-44 " 45-54 " 55-64 " All ages	15-24 years 25-34 " 35-44 " 45-64 " All ages
Education of wife	Elementary or less Some high school Some university	Elementary or less 1-3 years of high school 4-5 years of high schools Some university	Elementary or less Some high school some university

TABLE 4. Factors Analysed in Studies of the Labour Force Participation of Married Women in Canada – Concluded

Factor	Study		
	Allingham	Allingham and Spencer	Ostry
Education of husband		Elementary or less 1 - 3 years of high school 4 - 5 years of high school Some university	
Residence		Metro Other urban Rural non-farm Rural farm	Urban Rural non-farm
Region			Atlantic Quebec Ontario Prairies British Columbia
Child status		No children All younger than 6 All 6-14 Other	No children Some younger than 6 None younger than 6
Income of husband			Less than $1,000 $ 1,000 - $2,999 3,000 - 4,999 5,000 - 6,999 7,000 - 9,999 10,000 +

IV. THE SAMPLE SURVEY: THE DATA USED AND SOME COMPARISONS[13]

The empirical work to follow is based on a survey taken in April and May of 1964 by the Dominion Bureau of Statistics, and referred to as the *Survey of Consumer Finances 1964* (hereafter **SCF64**).[14] **SCF64** was primarily concerned to estimate the assets and debts position of families at the time of the survey, and to estimate their income for the year 1963. This information was then used to produce estimates of income, assets, and debts for the entire population of Canada, and for various subgroups. In the course of collecting such data, questions were posed on a number of other matters such as age, sex, marital status, employment status, and child status.

The sample survey was of non-farm families and unattached individuals.[15] The original sample consisted of approximately 8,400 households in 172 sampling areas. All cities of population 30,000 and over were represented in the sample, which was selected by multi-stage probability sampling within the framework of the Canadian Labour Force Sample. The sampling ratio varied to an extent with the size of the centre in that the high income areas in the four largest cities were relatively oversampled. Most data were collected by means of direct interviews conducted by trained enumerators from the labour force survey staff. Typically the head of the household was interviewed.

Of the 8,400 households in the sample, some 900 were vacant, contained business premises or were for other reasons not eligible for inclusion in the survey. The remaining 7,500 households contained approximately 8,300 families, 450 of whom were not interviewed because at least one member of the family received most of his income from farming.

In the end 6,401 satisfactory returns were secured from families and unattached individuals, representing a response rate of 82.4 per cent. Of the remaining 17.6 per cent, 4.9 per cent could not be contacted or were missed for some reason, and 12.8 per cent failed to co-operate.

For present purposes we included for our analysis only those families which included husband and wife present, with husband in the labour force; and we excluded members of the armed forces. In the end we were left with 4,476 families.

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[13] Readers willing to assume that the survey sample is adequately representative for purposes at hand may proceed directly to Chapter V.

[14] The publication based on **SCF64** is, Dominion Bureau of Statistics, *Incomes, Assets and Indebtedness of Non-Farm Families in Canada 1963*, (Ottawa: Queen's Printer, 1966).

[15] This paragraph and the following two are drawn from the above publication, p. 68.

An Overview of the Survey Data

Our particular interest is to shed some light on the question, "Why do married women work?", and also to indicate the circumstances under which such women are more likely or less likely to be in the labour force – i.e., either to be working or to be seeking work. As a starting point, however, it is valuable to know the basic pattern of the labour force participation of married women displayed in our sample before we attempt to analyse it. In particular, we focus on how the participation rate in **SCF64**, (which was collected with quite another purpose in mind) compares with other evidence, how the age distribution in the sample compares with that in the country as a whole, and how the geographic breakdown of the sample compares with the distribution of the population across the country. We emphasize that the primary reason for this exercise is to learn whether the particular sample data with which we are working can be viewed as reasonably representative of the situation in Canada, and hence provide a satisfactory basis for generalization.

Labour Force Participation Rates

In Chart 1 we depict the participation rates for the several age groups as obtained in our sample and in the 1961 Census. The data are recorded in Table 5. The data are not strictly comparable, since the Census participation rates refer more to a mid-year estimate (May-June) and the **SCF** is earlier in the year (March-April). Furthermore, the **SCF** data are collected using a stratified sample weighted in favour of urban, and especially relatively well-to-do urban dwellers, whereas the Census data in principle, include every person in Canada at the time, whether urban or rural, without regard to age or occupation. By contrast, our sample is restricted to non-farm families, excludes families whose income is derived primarily from military pay and allowances, and includes a disproportionate representation of families in high income areas in the largest cities.[16]

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[16] Of the various influences at work, we would expect that (1) since **SCF64** follows by almost three years the 1961 Census the average participation rates of married women will be higher; (2) the oversampling of larger centres will produce a somewhat higher figure for the **SCF64** participation rates; (3) the over-representation of relatively high-income families in the *Survey* will bias downward the observed participation rates of married women; (4) there is also a seasonal factor. The labour force participation rates of married women are typically somewhat lower in March-April (the time corresponding to the **SCF64**) than in May-June (the 1961 Census); (5) the 1961 Census participation rates are estimated for women 15 years and older; **SCF64** is not so restricted, but this factor is likely to be of very little importance quantitatively. (6) The census definition includes **all** married women, and not just those whose husbands are present and in the labor force. The impact of this difference is not clear.

CHART – I

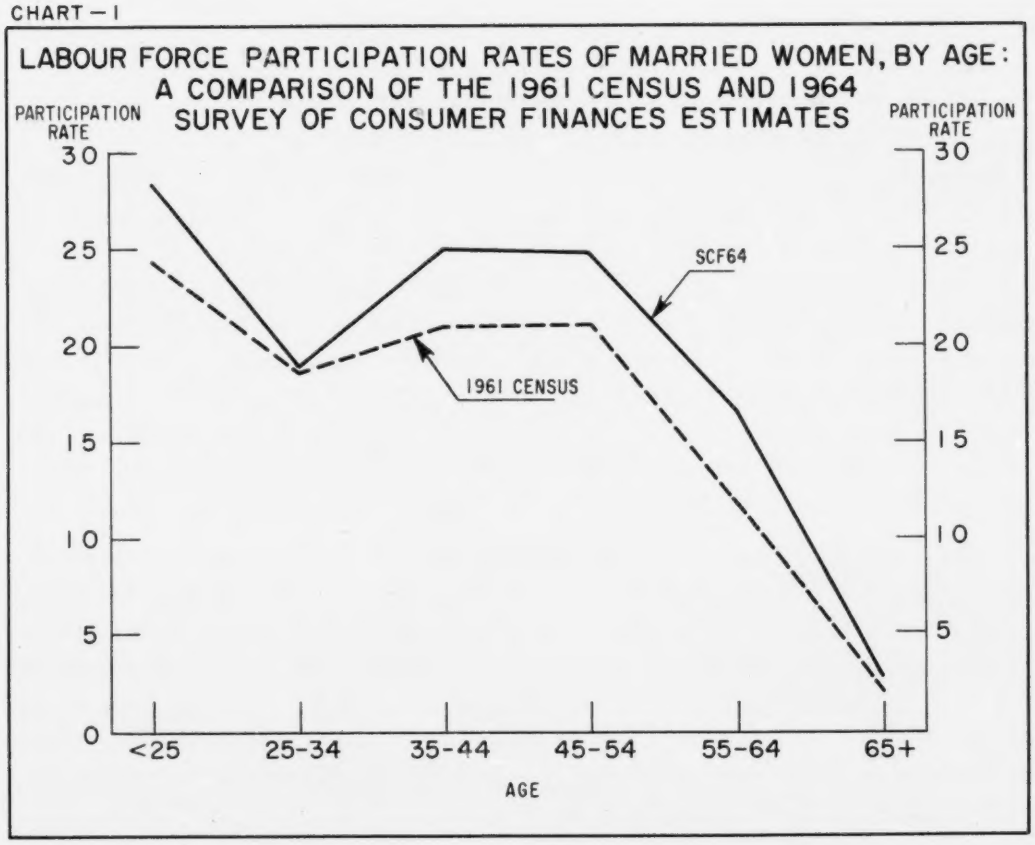

TABLE 5. Distribution of Ages and Labour Force Participation Rates of Married Women, Census 1961, and Survey of Consumer Finances 1964

	Age of wife						
	Less than 25	25 - 34	35 - 44	45 - 54	55 - 64	65 and over	All ages
Labour force participation rate:							
SCF 1964, per cent	28.4	19.0	25.0	24.9	16.7	2.8	21.2
Census, 1961, per cent	24.4	18.7	21.0	21.1	11.9	2.2	18.5
Age of wife:							
SCF 1964, number	486	1,127	1,162	874	502	325	4,476
SCF 1964, per cent	10.9	25.2	26.0	19.6	11.2	7.3	100.0
Census, 1961, per cent	10.4	26.3	26.3	18.8	11.8	6.6	100.0

Sources: 1961 *Census of Canada*, Vol. VII, Part 1, *General Review, the Canadian Labour Force*, pp. 12-37.

SCF64 unpublished tabulations.

Table 6 reports the monthly Labour Force Survey estimates of the participation rates of all married women for March through June of 1961 and 1964. In terms of time of collection, the 1961 May-June figures correspond most closely to the 1961 Census figure for "all". The rather large discrepancy in the estimates is probably more indicative of the respondent sensitivity to "the quality and specific practices of enumeration"[17] in answering questions relating to their labour force behaviour than it is to genuine discrepancies which would result if the Labour Force Survey were unrepresentative. Thus one could sensibly place greater confidence in the Labour Force Survey estimates of participation rates (Table 6) than in the 1961 Census estimates since the former, though obtained on a sample rather than a complete coverage basis, are obtained using rather better-trained enumerators. In any event we have confidence in the general shape of the age-patterns of labour force participation indicated in the Census.

The important point for our purpose is how the **SCF64** estimates of participation rates compare with the best available. We suggest that the comparison should be with the Labour Force Survey estimates. The Labour Force Survey estimated the 1964 March-April labour force participation rate of married women at 23.6 per cent (Table 6). The **SCF 64** estimate for "all" is 21.2 per cent, or about 2.4 percentage points lower. The difference is readily accounted for by the over-representation of relatively high income families in the sample.

Age Distribution of the Sample

In the lower part of Table 5 we compare the age distribution of married women in the survey with their age distribution in the 1961 Census. The figures are surprisingly close, and such differences as exist may be accounted for by the small changes in the age distribution of married women during the three year lapse between the two data collections.

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[17] Frank T. Denton and Sylvia Ostry, *Historical Estimates of the Canadian Labour Force*, 1961 Census Monograph, (Ottawa: Queen's Printer, 1967), p. 8, note.

TABLE 6. Labour Force Participation Rates of All Married Women, Selected Monthly Figures

Year	March	April	May	June
1961	19.7	20.5	21.1	21.1
1964	23.5	23.7	24.4	24.4

Source: DBS, Special Surveys Division, Mimeographed publication 9603-101 and 9603-513.

Geographic Distribution of the Sample

Table 7 records the regional distribution of observations included in the sample. The regional distribution of the sample and the population are very similar. The Prairies, which have a larger rural element than the country as a whole, are under-represented, and Ontario is over-represented.

Conclusion

On the basis of the several comparisons with data collected in other surveys, and for various purposes, we conclude that the 1964 Survey of Consumer Finance sample, which we use to analyse the determinants of the labour force participation of married women in Canada, is representative of the population as a whole.

TABLE 7. Geographic Distribution of Respondents in the Survey of Consumer Finances, 1964, and the Population, 1964

Region	Sample		Population
	Number	Per cent	Per cent
Atlantic	417	9.3	10.3
Quebec	1,290	28.8	29.0
Ontario	1,731	38.7	34.3
Prairie	619	13.8	17.4
British Columbia	437	9.8	9.1
Total	**4,476**	**100.0**	**100.0**

Sources: Unpublished **SCF64** tabulations, and the *Canadian Statistical Review.*

V. SPECIFICATION OF A MODEL FOR EMPIRICAL ANALYSIS[18]

We now turn to consider which of the several determinants of the labour force participation of the wife discussed in Chapter II can be investigated in the current study, and how each of those determinants could be expected to make itself felt.

The major advantage of the present study is to use micro-economic data to investigate the impact which various financial variables – income, assets, and debts – have on the labour force participation of married women. For this purpose our information is the best currently available. We know the family's income for the calendar year preceding the survey, and we know their holdings of assets and debts at the time of the survey. We are also able to comment on systematic differences in tastes for work by considering other data available.[19]

However, in order to make our general formulation of the determinants of the labour force participation of married women amenable to empirical investigation and analysis we must decide, somewhat arbitrarily, the nature of the relationship involved. One important assumption in our empirical work is that the determinants of the labour force participation of married women enter into the wife's consideration in essentially an addi-

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[18] In connection with the continuing study of the determinants of labour force participation it may be of interest to note that the equations estimated in this study were specified in August, 1967.

[19] On the other hand there are major factors which we are not able to consider. For example, the sample survey learned nothing of the education of the wife – clearly a factor of considerable importance in determining both the income potential of a married women, Y^p_w, and her tastes. (For an earlier quantitative analysis of the impact of the wife's education on her labour force participation see Allingham and Spencer, *op. cit.*, which used highly aggregated data collected in the 1961 Census. In addition we note that in this study we have available but a few of many possible indicators of taste. For example, it would be interesting to investigate the impact which religion (or religious denomination), occupation of husband, work history of the wife, and many other factors have – and indeed whether they have a discernible influence – on the labour force participation of the wife. We are, however unable to look at these, and must now leave them in the "random" component.

We also lack knowledge of whether or not the wife was expecting a child at the time of the survey. While the proportion of the sample may not be important, women typically withdraw from the labour force at least temporarily, while pregnant. Similarly we know nothing of the respondent's country of origin, the length of time which he has lived in his current dwelling or at least the same city or town. We know nothing of the employment experience of the head beyond his current employment status: presumably even if he were employed at the time of the survey, his wife is more likely to be in the labour force if he has experienced some difficulty maintaining regular employment than if he has not.

Many of these factors are taken into account in a forthcoming study, of which Byron G. Spencer is one of the authors. Mr. Nicholas Skoulas, is also using Canadian cross sectional data to investigate numerous hypotheses of the determinants of the labour force participation of married women in Canada.

tive way. That is, we assume that a married women is able to give separate consideration to each of the determinants because they are largely independent in nature.[20] While the assumption of no interactions among the independent variables is not strictly true, it is perhaps a reasonable approximation on which to proceed.

The Basic Model

The basic model can be written as:

$$p_i = a_1 f_{i1} + a_2 f_{i2} + \ldots + a_j f_{ij} + \ldots + a_n f_{in} + a_o + \epsilon_i$$

where p_i is a dummy variable with unity indicating the participation of the wife of the i^{th} family in the labour force, the f_{ij} is the j^{th} factor for the i^{th} family which is assumed to influence the labour force participation of the wife, the a_i is the coefficient indicating the importance associated with this factor and a_o is the constant term. The ϵ_i is an error term representing random, unexplained factors.[21] This is a simple additive model with n factors and no interactions.[22]

These factors are either quantitative or qualitative. The quantitative factors are naturally expressed by numerical variables while qualitative factors are artificially expressed as numerical variables by the use of dummy variables.

At this point a basic decision has to be made whether to use the analysis of variance or the multiple linear regression technique to measure the effects of the factors. Since we use cross-section sample survey data we have no control over the number of observations falling within the various ranges or subgroups of the factors selected. From an analysis of variance viewpoint, this model would yield an unbalanced design and probably some empty cells, with the result that the accompanying theoretical and computational difficulties would be overwhelming. On the other

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[20] We are encouraged in this assumption by the fact that the range of our experimentation with the functional form produced only small changes in the estimated impact of those factors not then under review.

[21] Some technical aspects of dummy variable regression analysis, including a discussion of the special problems associated with the error term, are discussed in Appendix C.

[22] It would be possible to include interaction terms in this framework. For example, using the same method of analysis Cohen has included interaction terms for the wife's age (35-54, 55-64, 65+) and her education (8-11, 12-15, 16+ years); her education (16+) and child status (children aged 0-3, 3-5, 3-17, and 6-17); and her age and husband's employment status (employed, unemployed). See Malcolm S. Cohen, "Married Women in the Labour Force: An Analysis of Participation Rates", *Monthly Labour Review*, October 1969, pp. 31-35.

hand, multiple regression analysis can be employed in this situation without undue difficulty.[23] We therefore use multiple regression analysis.

The additional question arises whether to use the observations on households directly, or first to aggregate them to an extent. The advantages of using the micro data directly have recently been investigated, first on the assumption that the individual units have identical behaviour patterns, and secondly on the assumption that their behaviour differs. In both cases the authors conclude, using a simulation study, that the direct use of individual observations is preferred.[24] Since we were committed to the use of micro data before their studies appeared we are reassured by their conclusions.

There are two basic approaches in the use of multiple linear regression analysis with cross-section data. One method is to represent quantitative factors on the continuous scale and to quantify certain qualitative factors through the use of dummy variables. The other method is to represent all factors as dummy variables. Each method has its advantages and disadvantages and neither technique is clearly superior to the other. In an effort to clarify the relative usefulness of each method two parallel analyses were undertaken, having as a starting point a common set of factors. The part-continuous-part-dummy variable model will now be discussed while the dummy variable model will be discussed in Chapter VIII.

Specification of the Equation: the Continuous Variables

We suggested, in Chapter II, the range of determinants which appears to be important in explaining why married women work. We must now consider the way in which each of the various factors to be included in our study is likely to make its influence felt and, hence, to suggest the appropriate way in which the factors will enter our empirical work. In other words, we must make plausible assumptions regarding the impact of each variable alone. For example, could a unit change in one of the explanatory variables be expected to have about the same impact on the wife's labour force participation regardless of the level from which that change occurred, or would one expect the impact to be enhanced or diminished as the base

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[23] Davis has considered closely the advantages of analysis of variance in a similar context. See, *Some Methods of Analysing Cross Classified Census Data: the Case of Labour Force Participation Rates*, by N.H.W. Davis, Dominion Bureau of Statistics, Special Labour Force Studies, Series B, No. 3, (Ottawa: Queen's Printer, 1969).

[24] G.H. Orcutt, H.W. Watts, and J.B. Edwards, "Data Aggregation and Information Loss", *American Economic Review*, 58, September 1968, pp. 773-87; and J.B. Edwards, and Guy H. Orcutt, "Should Aggregation Prior to Estimation be the Rule?", *Review of Economics and Statistics*, LI, November 1969, pp. 409-20.

level increased? To take a specific case, we have suggested that, other things equal, a wife is less likely to work the higher her husband's income. But how much less likely? Suppose an increase in the husband's income from $5,000 to $6,000 reduces by 5 per cent the probability that the wife will be in the labour force. If that $1,000 increment had been from $10,000 to $11,000, would the same impact on the wife's labour force behaviour be felt? Probably not.

Consider Chart 2. On the vertical axis we plot the dependent variable, the labour force participation of married women. The legitimate range of values which it can assume extends from zero to one hundred per cent: at one extreme all married women could stay "at home", at the other they could all be in the labour force.

On the horizontal axis we plot levels of one of the variables or factors – which we designate "determinants" – with which we attempt to **explain** the level of the dependent variable. In this example, we plot the income of the husband, Y_h, on the horizontal axis.

Depicting the situation in this way allows us to consider, one by one, the probable impact which the explanatory variables will have on the dependent variable. We have already hypothesized that the higher the level of income available to the family if the wife is not working, the less likely is she to work. Thus we would expect to find a downward sloping relationship connecting points on the two axes. But what specific shape is that downward slopping relationship likely to assume?

Line AA in Chart 2(a) suggests that the relationship is linear: an increase of $1,000 in the husband's income will have the **same** negative impact on the probability that the wife will be in the labour force whether his initial income was $5,000 or $10,000. Line BB in Chart 2(b) suggests that the relationship is nonlinear. It is drawn in such a way that $1,000 increase in the husband's income will have a lesser impact on the probability that his wife will be in the labour force, the higher the level of his income. The case is clear in the chart: the $1,000 increase to $6,000 reduces by a much larger amount the probability that the wife will be in the labour force than does a similar increase from a base of $10,000. A similar set of charts could be drawn for each of the remaining financial variables (asset and debt holdings) which we are considering.[25] In Chart 2(a) the regression equation would take the form

$$p = a_o + a_1 Y_h.$$

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[25] There are, of course, many other specifications which could be considered. We restrict ourselves to the two indicated since they are both widely used and plausible.

In the second case the **reciprocal** of the income variable is used, and the equation becomes

$$p = \beta_o + \beta_1 \frac{1}{Y_h}.$$

Which form shall we use in the actual estimation of the relationship? Each has its merits. The linear case is particularly easy to understand, and yields results which are readily interpreted. One defect in the current use is that it will intersect the horizontal axis at some positive level of income, and thereby produce the untenable implication that participation rates could fall below zero – i.e., that fewer married women than zero married women could work.[26] Perhaps more importantly, as mentioned already, the **linear** nature of the relationship implies that a given change in the explanatory variable is expected to yield the same (absolute) change in the level of the dependent variable, regardless of the initial level of the explanatory variable. The implication seems to us contrary to common sense; rather, the absolute impact is likely, in general, to diminish as the level of the explanatory variable increases. We therefore choose to specify that each of the financial variables enters the relationship in a reciprocal form, as illustrated in Chart 2(b).[27]

In Table 8 there are brief definitions of the continuous variables used in the analysis, together with the form in which they enter the regression equations. A detailed definition of each variable is provided in Appendix A. Note that rather than a simple inverse, e.g., $1/(Y_f\text{-}W)$ we use $1000/(Y_f\text{-}W + 1000)$. The latter form is identical for purposes of interpretation, but has the empirical advantage that it is not undefined should the explanatory variable (in the example, $Y_f\text{-}W$) happen to be zero.

Specification of the Equation: The Qualitative Variables

In addition to the financial variables, for which we have measures, we wish to consider the impact of several **qualitative** factors which are likely to be of importance. Among these are the indicators of child status, and of location. For each of these factors we assume that the impact is such as to **shift** the relationship up or down in a parallel fashion. Let us

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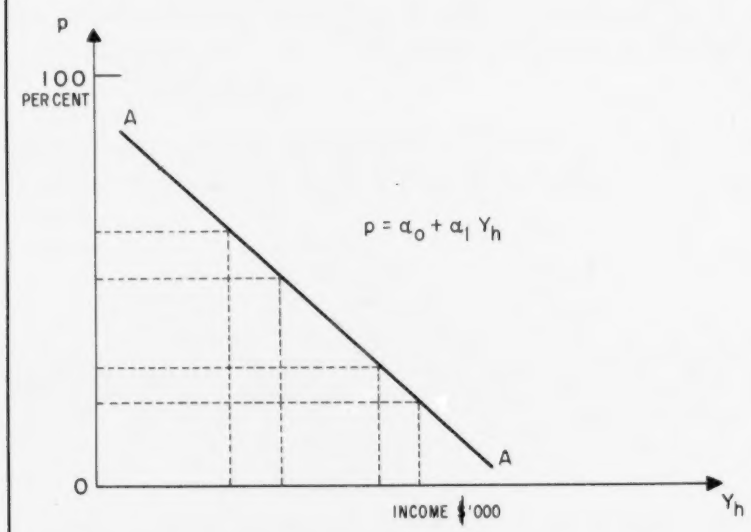
[26] Of course this defect will not be serious if the slope of the relationship is quite flat and the intersection with the horizontal axis occurs at a very high level of income.

[27] The use of a nonlinear relationship in regression analysis raises once again the question whether it is better to aggregate the data prior to estimation, or to use the micro data directly. While no study has been undertaken specifically to answer this question, Edwards and Orcutt comment that they "do not deal with cases where micro components have nonlinear relations, but the need for disaggregated data in such cases seems fairly obvious without Monte Carlo experiments". Edwards and Orcutt, *op. cit.*, p. 409.

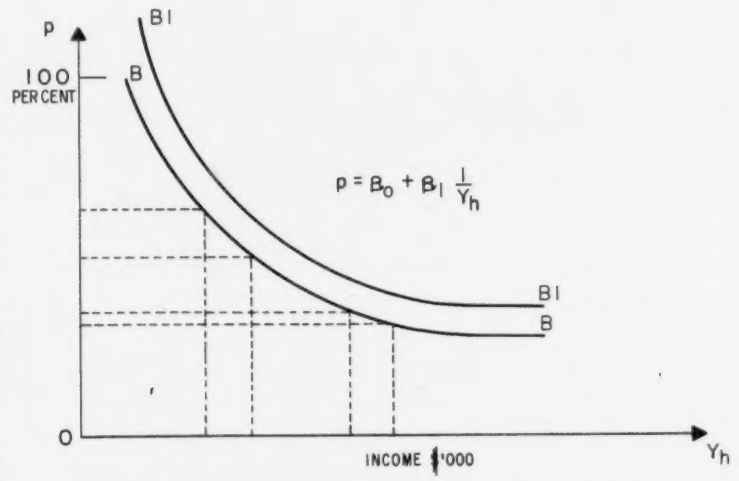
CHART – 2

ALTERNATIVE SPECIFICATIONS OF THE HYPOTHESIZED RELATIONSHIP BETWEEN THE LABOUR FORCE PARTICIPATION RATE OF MARRIED WOMEN AND ITS DETERMINANTS

2a



2b



illustrate what this means. Consider Chart 2(b). Assume that BB depicts the relationship which exists between the probability that the wife will be in the labour force and the income of the husband **when a young child is present.** The presence of a young child presumably reduces the probability that the wife will be in the labour force. The assumption which we adopt is simply that any other circumstances shift BB to another position, a uniform vertical distance from the old. Such a line is B1B1 which may, for example, represent the relationship when no children are present.

TABLE 8. Continuous Variables Used in the Regression Analysis

Variable name	Variable definition	Form in estimated equation
Income:		
Y_f-W	Total before-tax family income, from all sources, for the calendar year 1963, excluding earnings of the wife.	$\frac{1000}{(Y_f\text{-}W) + 1000}$
Debts:		
D_{st}	Short-term debts of the family as of the survey week. The entry includes all non-mortgage debt of the family.	$\frac{1000}{D_{st} + 1000}$
D_{lt}	Long-term debts of the family as of the survey week. It is the total mortgage debt on all real estate.	$\frac{1000}{D_{lt} + 1000}$
Assets:		
A_{st}	Liquid assets of the family as of the survey week.	$\frac{1000}{A_{st} + 1000}$
S	Value of all stocks owned by the family as of the survey week.	$\frac{1000}{S + 1000}$
OF	Value of other financial assets owned by the family as of the survey week.	$\frac{1000}{OF + 1000}$
EQ	Value of family equity in real estate as of survey week	$\frac{1000}{EQ + 1000}$
Age:		
AGE_w	Age of wife at the time of the survey.	$\frac{1}{AGE_w}$

We assume that the impact of all qualitative factors takes this form. The entire range of qualitative factors is defined as a series of dummy variables in Table 9.

TABLE 9. Dummy Variables Used in the Regression Analysis[1]

Variable name	Variable definition
Labour force status of husband, survey week:[2]	
L_h^u	Husband unemployed.
L_h^s	Husband self-employed.
L_h^e	Husband employed.
Child status:[3]	
Ch_o	No children present.
Ch_{1-5}	All children between the ages of one and five years.
Ch_{6-14}	All children between the ages of six and fourteen years.
Ch_{15-16}	All children between the ages of fifteen and sixteen.
Ch_{17-19}	All children between the ages of seventeen and nineteen.
Ch_{sit}	At least one child between the ages of one and five plus one other older child.
Ch_{old}	All children six years or older, and fall into more than one of the above age groups.
Adults:	
OA	An adult other than the head and wife was present.
Geographic factors:	
M	Metropolitan. The family was living in a metropolitan area.
Regions	Region of residence at time of survey.
Atl.	Atlantic Region, (Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick).
Que.	Quebec.
Ont.	Ontario.
Pr.	Prairie Region. (Manitoba, Saskatchewan, and Alberta).
B.C.	British Columbia.
Stocks misreported:	
S_{mr}	Family holding of stocks misreported. It was indicated that the family had stock holdings as of the survey week, but information obtained was insufficient to permit an estimate of their value.

[1] In all cases the variable is set to one (1) to indicate that the condition in question is satisfied; otherwise it is set equal to zero (0).
[2] The survey week was in March and April of 1964.
[3] Presence of children in the family at the time of the survey.

VI. ANALYSIS OF THE SURVEY OF CONSUMER FINANCES, 1964

A. The Regression Results, All Ages Together

In Table 10 we record the results of regression estimation for our entire sample of 4,476 observations.[28] Subsequent tables record the estimated impact of the same factors, restricted to families living in "metropolitan" and "non-metropolitan" areas, respectively.

The Income, Assets, Debts, and Age Factors

The extensive use of the reciprocal form in the explanatory variables complicates, to an extent, the interpretation of results. We therefore illustrate the interpretation of the tables by considering in detail the case of all observations in the sample – i.e., the first column of Table 10.

Interpretation of the Estimates.

Beside the variable "Income of family excluding earnings of wife", we find the number 0.317, which is the **coefficient** attaching to that variable. More precisely, it is the coefficient attaching to a particular reciprocal of that variable, namely

$$\frac{1000}{(Y_f - W) + 1000}$$

Let us consider its interpretation. Suppose the value of $Y_f - W$ were $5,000. The value of the reciprocal would be

$$\frac{1000}{5000 + 1000} = .167$$

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[28] The observations which we use are a subset of those obtained from a larger sample. The entire sample, in turn, employed a rather complex weighting structure designed to estimate various aggregates, such as average debt holdings by type of family. Since the battery of statistical significance tests which one typically employs assumes that the observations are drawn on a simple random basis, questions naturally arise concerning the use of standard statistical procedures.

In a similar context Sobol has investigated the impact on the standard errors of the estimates when using a clustered sample without adjusting for the weighting structure. She concluded that "for (her) sample, true standard errors were quite similar to simple random errors". Marion B. Sobol, "Commitment to Work", in Ivan Nye and Lois W. Hoffman, *The Employed Mother in America*,(Rand McNally, 1963), p. 43. In addition we suspect that any bias in our estimated coefficients, particularly in the dummy variable estimates reported in Chapter VIII, is small.

Klein has outlined a procedure intended to yield unbiased least squares regression estimates when using weighted sample survey data. However, it is uncertain that the use of the complex weights employed in collecting the data for **SCF64** would yield estimated regression coefficients which would be theoretically superior to those obtained using unity weights. See L.R. Klein, *Textbook of Econometrics*, (Evanston: Row, Peterson, 1953), pp. 305-13.

TABLE 10. Analysis of the Labour Force Participation of Married Women, Canada

Variable or attribute	Age groups			
	All ages	Less than 25	25-34	35-44
Total income of family, excluding earnings of wife	**.317[1]**	**.451[2]**	**.420[1]**	**.298[1]**
Financial variables:				
Debts:				
Short term	-.101[1]	-.109	-.070[2]	-.064
Long term	-.090[1]	-.055[4]	-.061	-.061[2]
Assets:				
Liquid	.155[2]	-.461	.334	.416[5]
Liquid, squared	-.231[1]	.157[4]	-.428[3]	-.383[5]
Stocks	.075[3]	.050[4]	.044[4]	.147[3]
Other financial	.099[1]	-.149[4]	.116	.104
Equity in real estate	.092[1]	-.033[4]	.091[5]	.036[4]
Misreported stocks	-.028[4]	.173[4]	.126[4]	.070[4]
Labour force status of husband:[6]				
Unemployed	.130[1]	.086	.079	.136[5]
Self-employed	-.048[3]	-.169[2]	-.012[4]	-.130[1]
Employed	[7]	[7]	[7]	[7]
Child status:				
No children	-.272[1]	-.318[1]	-.437[1]	-.254[1]
All children less than 6 years	-.033	--	-.277[1]	-.135[1]
All children aged 6-14 years	.013[3]	--	--	-.041[4]
All children aged 15-16 years	.039	--	--	.158[2]
All children aged 17-19 years				
Children less than 6 plus other children	-.220[1]	-.185[2]	-.450[1]	-.303[1]
All children 6 years or older	-.048[5]	--	--	-.115[3]
Presence of other adults in family	.070[1]	.070[4]	.086[5]	.031
Metropolitan	.067[1]	.135[1]	.052[5]	.055[5]
Region of residence:				
Atlantic	-.087[1]	.004[4]	-.082[5]	-.090[3]
Quebec	-.113[1]	-.075	-.058[3]	-.179[1]
Ontario	[7]	[7]	[7]	[7]
Prairie	.004[4]	.022[4]	.036	-.013[4]
British Columbia	-.063[1]	-.019[4]	-.070[2]	-.107[3]
Age of wife	9.644[1]			
Common term	-.073	.777	.386	.157
$\bar{R}^2$	.1157	.1414	.1686	.1422
F	25.39	5.20	12.42	9.37

See footnotes at end of table.

TABLE 10. Analysis of the Labour Force Participation of Married Women, Canada – Concluded

Variable or attribute	Age groups		
	45-54	55-64	65 and over
Total income of family, excluding earnings of wife	**.454[1]**	**.497[1]**	**.258[1]**
Financial variables:			
Debts:			
Short term	−.135[3]	−.212[1]	−.036[4]
Long term	−.068	.014[4]	−.052
Assets:			
Liquid	−.249	−.112[4]	−.089[4]
Liquid, squared	.132[4]	−.063[4]	.036[4]
Stocks	.133[5]	.036[4]	−.052
Other financial	.119	.100	.007[4]
Equity in real estate	.122[1]	.093[2]	−.004[4]
Misreported stocks	−.084[4]	−.191	.005[4]
Labour force status of husband:[6]			
Unemployed	.150[5]	.072[4]	.304[1]
Self-employed	−.033[4]	−.022[4]	−.035[4]
Employed	[7]	[7]	[7]
Child status:			
No children	--	--	--
All children less than 6 years	−.103[5]	--	--
All children aged 6-14 years	.015[4]	--	--
All children aged 15-16 years	−.002[4]	.019[4]	--
All children aged 17-19 years	−.226[1]	--	--
Children less than 6 plus other children	−.104[3]	−.064[4]	--
All children 6 years or older	.071[2]	.040[4]	.015[4]
Presence of other adults in family	.087[1]	.035[4]	.016[4]
Metropolitan			
Region of residence:			
Atlantic	−.147[1]	−.195[1]	.059[2]
Quebec	−.149[1]	−.123[1]	.007[4]
Ontario	[7]	[7]	[7]
Prairie	.041[4]	−.012[4]	−.016[4]
British Columbia	−.047[4]	−.056[4]	−.039
Age of wife			
Common term	.137	.176	.096
$\bar{R}^2$	.0874	.0652	.0489
F	4.80	2.84	1.98

[1] Significant at 0.5% level.
[2] Significant at 5% level.
[3] Significant at 1.0% level.
[4] Standard error exceeds regression coefficient.
[5] Significant at 2.5% level.
[6] See footnote 31, page 44.
[7] This category is constrained to zero for statistical reasons. See Appendix C.

We can now find the contribution of the income variable in explaining the predicted level of the wife's participation rate:

$$0.167 \times 0.317 = 0.0529$$

That is, the $5,000 income figure alone would contribute 5.29 per cent towards our estimate of the probability that a wife will be in the labour force when she is faced with a set of circumstances including an annual family income of $5,000 if she has no earnings. What if the income figure were $6,000? The contribution of the income variable to the estimated probability that the wife would be in the labour force would be:

$$0.317 \times \frac{1000}{6000 + 1000} = 0.0453$$

The contribution of the income figure would thus be 4.53 per cent, which is .75 per cent lower than if the income were $5,000. The estimated coefficient is therefore consistent with our hypothesis that a higher level of family income, excluding the earnings of the wife, tends to reduce the probability that the wife will be in the labour force. However, the form of our equation is such that the absolute magnitude of the impact declines as income increases. Thus, for example, an increase in income from $10,000 to $11,000 would reduce our estimate of the probability that the wife would be in the labour force by only .24 per cent (if income were $10,000 its contribution would be 2.88 per cent, if $11,000, 2.64 per cent). A similar interpretation holds for each of the dollar-valued variables in the equation.

Analysis

We record in Table 11 the estimated impact on the probability that the wife will be in the labour force of a one per cent increment in the absolute value of each of the income, asset, and debt variables. We select for consideration two sets of initial levels in order to illustrate the non-linear nature of the relationship which has been estimated. For the first initial level we use the average of the families in the sample. For example, $753.09 is the average value of short-term debts reported by the survey respondents. The second initial level is simply the first plus 50 per cent.

Consider first the estimated impact of the income variable. At its mean level of $5,750, a one per cent increase would reduce by 0.04 per cent the probability that the wife would be in the labour force. If, however, the level of income were 50 per cent higher (at $8,625) a similar percentage increment would reduce the probability that she would be in the labour force by only 0.03 per cent. A similar interpretation holds for each of the asset and debt variables. We note that the postulated one per cent change in the level of each of the financial variables has a somewhat smaller impact than a similar change in the income variable on the

probability that the wife will be in the labour force. We also note that an increase in the level of debt holdings makes it rather more likely that the wife will be in the labour force whereas an increase in the level of asset holdings makes it rather less likely. Both these findings are consistent with our hypotheses regarding the probable impact of these variables.[29] In particular, the findings are **not** consistent with the hypothesis that the wife enters the labour force in order to enable the family to accumulate assets or to incur debts. Support for these hypotheses would require opposite signs on the estimated coefficients.

Each of the asset and debt variables appears to have approximately the same absolute impact on the probability that a married woman will be in the labour force.

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[29] We have included both short-term assets and short-term assets squared in the analysis. The reason is that simple reciprocal relationship appeared not to capture this impact of this assets variable. On the other hand the more complicated form is found to have greater explanatory power.

TABLE 11. Estimated Impact of a One Per Cent Change in the Level of Each of Several Explanatory Variables on the Probability that a Married Woman will be in the Labour Force

Variables	Initial level one[1]	One per cent change	Effect on participation rate	Initial level two[2]	One per cent change	Effect on participation rate
	dollars		per cent	dollars		per cent
Income:						
$Y_f - W$	5,750.21	57.50	– 0.040	8,625.32	86.25	– 0.029
Debts:						
D_{st}	753.09	7.53	+ 0.025	1,129.64	11.30	+ 0.025
D_{lt}	2,861.21	28.61	+ 0.017	4,291.82	42.92	+ 0.015
Assets:						
A_{st}	2,246.33	22.46	– 0.033	3,369.50	33.70	– 0.027
S	1,658.36	16.58	– 0.041	2,487.54	24.14	– 0.015
OF	439.46	4.39	– 0.021	659.19	6.59	– 0.024
EQ	7,962.00	79.62	– 0.009	11,943.00	119.43	– 0.006

[1] The values selected for initial level one are the actual means in the sample.
[2] The second set of initial values are 50 per cent greater than the first set.

Source: Unpublished **SCF64** tabulations.

Reliability of the Estimates

The basis for our confidence is indicated by numbered superscripts on the coefficients in our tables. Each of these symbols is used to indicate how likely it is that in the real world, about which we are trying to learn, the influence of the factor in question is not the coefficient which we have estimated, but rather **zero.** Thus, for example, what is the likelihood that we could have estimated 0.317 as the coefficient attaching to our income variable when in fact, in the real world, the influence is zero? The [1] which appears in this case tells us that we can be very confident that such is not the case: if in the real world the level of family income had no impact on the wife's labour force behaviour our chances of selecting a sample indicating that the influence was as suggested, are less than 5 in 1000. Similarly a [3] indicates that the chances of such a sample are less than 1 in 100; a [5] tells us the chances are less than 2.5 in 100; and the [2] tells us that the chances are less than 5 in 100. Finally, a [4] tells us that the chances are very good indeed that the coefficient is **not** really different from zero.[30]

In Table 10 for the "all observations" case we see that we can have rather substantial confidence in the estimates of the impact which each of the several income, asset, and debt variables has in explaining the labour force behaviour of married women. The one exception is the case of misreported stocks.

The "misreported stocks" variable indicates that the family had holdings of stocks at the time of the survey, but did not provide sufficient evidence that it was possible to estimate the value of such holdings. The hypothesis which we test in this case is that the **presence** of stocks has an impact on the labour force participation of the wife. We would expect a negative coefficient: the presence of stocks would suggest a greater collection of assets than would obtain in their absence. The sign of the estimated coefficient is consistent with this hypothesis, but its value is not significantly different from zero.

Analysis of the Qualitative Factors

Each of the remaining variables enters in a straight-forward manner which greatly assists in interpreting the results.

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[30] The estimation procedure which we have employed, ordinary least squares for an equation with a dummy dependent variable, will yield biased and inconsistent estimates of the standard error of each regression co-efficient. However, in Appendix C, we present evidence suggesting that the standard errors as estimated are larger than their true values and hence we can place even greater confidence in the results than we suggest in the text.

Employment status of the husband. – For all observations included in our analysis, the husband was **present** at the time of the survey. That is, he had not, in one way or another, permanently left the family.

The employment status of the husband is limited to three possibilities: he could be employed for pay, self-employed, or unemployed.[31] In order to estimate the influence of the three possible employment status groups we designate one category as the **standard case** and consider the remaining cases in relation to it.[32] For example, we have selected "employed for pay" as the standard case. The figure 0.130 beside "unemployed", L_h^u, indicates that, other things equal, a wife is about 13 per cent more likely to be in the labour force if her husband was unemployed at the time of the survey than if he was an employee. Similarly, she is about 4.8 per cent less likely to be in the labour force if he is self-employed than if he is an employee.

The rationale in these cases is fairly obvious: if the husband was unemployed at the time of the survey, he has probably experienced other instances of unemployment, and the wife may well be in the labour force partly in order to supplement the family income during such periods. On the other hand, self-employment provides relatively great job security, which in itself would reduce the need for the wife to work. In addition it may be useful that she be available for occasional assistance in her husband's business, in which case she could be classified as not in the labour force.[33]

Including the husband's employment status in the analysis also permits a direct test of the additional worker hypothesis. The hypothesis states that the marginal family workers tend to enter the labour force when the regular earner is unemployed. The major advantage of the present study is that with micro data one can readily control for all the "other" factors, and thus have a relatively satisfactory test of the hypothesis. Clearly our empirical work strongly supports the additional worker hypothesis.

Child status factors. – Again we must select the standard case which will serve as a standard of comparison for the others. To facilitate interpre-

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[31] If he was not in the labour force at the time of the survey – e.g., he was a student, or was retired – the family was omitted from the analysis.

[32] In fact, one category is constrained to zero for statistical reasons: if it were not, none of the regression coefficients could be estimated. See Appendix C.

[33] During the survey week if she works for even one hour in her husband's business she ought to be counted as an "unpaid family worker". However, this group is very difficult to identify, and its members frequently appear as "not in the labour force". In the **SCF64** the convention adopted was to classify **all** unpaid family workers as not in the labour force.

tation we select the case of **no children** present.[34] Thus the figure – 0.272 opposite the variable indicating that there are young children present, all less than six years old, suggests that a married woman is 27.2 per cent less likely to be in the labour force when she has one or more young children at home than when she has no children. The presence of a young child is thus, in fact, a very strong deterrent to the labour force participation of the wife. To continue, if all children in the family are between the ages of 6 and 14, the figure –0.033 indicates that the wife is only about 3.3 per cent less likely to be in the labour force than if she has no children at all. Furthermore, the difference between the estimated impact of no children and all children between the ages of 6 and 14 is not statistically significant: we do not have sufficient evidence in the "all ages" group to suggest that the cases have distinct impacts on the wife's labour force behaviour. Similarly, the presence of only children fifteen years or older apparently has very little impact on the wife's labour force behaviour, as compared to our standard case. If any impact at all, the positive signs attaching to the coefficients suggest that the presence of such children may even provide a mild impetus favouring her labour force participation. However, it is surprising that the presence of children between the ages of 6 and 14 does not have an impact on the mother's labour force behaviour quite distinct from that when no children are present. We shall consider this matter further when we look at the separate age groups.

The child status group defined to include youngsters (younger than six) plus older children (those over six), has an estimated impact only slightly smaller than for the younger than six group alone. It thus appears that the presence of a young child tends to dominate the child status code. The presence of only younger children makes the wife about 27 per cent less likely to be in the labour force than a wife with no children, whereas a young child together with older children makes her participation about 22 per cent less likely.

The presence of older children in more than one of the over six age categories is a statistically significant deterrent to the labour force participation of the wife. The indication is that such a combination of children provides a stronger deterrent to the labour force participation of the wife than does the presence of children in any one of the age categories of which this is composed. Perhaps the category captures more the influence of the number of children present than do the others.

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[34] No children **present** means that there were no children living in the household at the time of the Survey. In the case when children were present their number would include children other than those of the head and wife who were living in the same household – e.g., children of relatives.

Presence of an "extra" adult in the family. – This variable has been included in the analysis in order to learn the typical impact which the presence in the family unit of adults other than the head and his wife has on the labour force participation of the wife.

Clearly the impact could go either way: the "extra adult" could encourage the labour force participation of the wife either by serving as a substitute homemaker, thus freeing her to work, or by simply being financially dependent. On the other hand, that extra adult may himself be in the labour force, he may not be willing or able to housekeep and in some cases (that of an invalid, for instance) he may require the home attention of the wife. The evidence, in the all ages and regions case, suggests that the presence of such a person increases by about seven per cent the probability that the wife will be in the labour force.[35]

Residence in a metropolitan area. – For a variety of reasons one might expect to find a difference between the labour force participation rates of married women in relatively large and relatively small centres. Thus the respondents in our sample were divided into those living in a "metropolitan area" and those living in "non-metropolitan areas", the dividing figure being 30,000.

The larger the centre the wider the range of employment opportunities available to a married woman, and also the less likely she is to feel social pressures suggesting that she ought to stay in the home. There is a relatively greater availability of commercial day-care facilities for children in larger centres. On the other hand the various costs incurred in going to work may increase with the size of the centre. For example, it is probably true that the larger the centre the greater the cost to hire substitutes for the home services of the mother and wife.

Our estimates suggest that residence in a large centre, on balance, favours the labour force participation of married women. In fact, it appears that other things equal, a married woman is about 7 per cent more likely to be in the labour force if she lives in a metropolitan rather than a non-metropolitan area.

Regional factors. – Canada is a very large country – large enough that attitudes and tastes for work can vary widely from one part to another. We have, therefore, included in our analysis a set of five variables (one for each major region) to capture any such regional differences. We select Ontario as the standard for comparison.

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[35] This finding is not supported in a study using U.S. data. See James N. Morgan, Ismail Sirageldin, and Nancy Baerwalt, *Productive Americans*, University of Michigan, Survey Research Centre Monograph 43, (Ann Arbor, 1966), pp. 46-50.

In Table 10, column one, we see that for all age groups combined, and once the factors are taken into account, residence in the Atlantic, Quebec, and British Columbia regions tends to produce a lower participation rate on the part of married women, as compared to Ontario. The Prairie region, on the other hand, does not have a regional influence distinctly different from Ontario.

Reliability of the Estimates

The reliability of the binary variable coefficient estimates is also indicated by the numerical superscripts appearing on the estimated coefficients. The corresponding confidence levels are listed in the footnotes of Table 10. In this case, however, the superscripts tell us whether the category whose value has been estimated is significantly different from the **standard** case. Thus, for example, the presence of young children is a significant deterrent to the labour force participation of the wife when compared to the standard case of no children.

Concluding Comments on the All Ages Case

When we consider together all the observations in our sample, drawn from such a diverse set of circumstances, it is reassuring to find that our regression analysis lends support to a number of common-sense hypotheses regarding the determinants of the participation of married women in the labour force.

We have found, for example, that all the various income, asset, and debt variables whose impacts we have been able to measure have what might be judged a plausible magnitude of impact of the wife's labour force behaviour. Furthermore for each of the variables we found a measure of impact which is statistically reliable, in the sense that there is a very small chance indeed that the true impact of the variables is zero.

Regarding the impact of the employment status of the husband, we found, reasonably enough, that the wife is much more likely to be in the labour force herself if he is unemployed than if he is not. Furthermore, she is less likely to be in the labour force if her husband is self-employed rather than an employee.

The impact of child status is clearly very great. In particular, the presence of a child under 6 years provides a very strong deterrent to the labour force participation of the wife. The evidence for all age and residence groups together suggests that the presence of a child between the ages of 6 and 14 is not a very strong deterrent to the wife's labour force participation. However we shall consider that matter at greater length when we study the results for the individual age groups.

We also found that for all the age and residence groups considered together the impact of both the region and the size of the centre of residence have an important impact on the labour force behaviour of the wife. She is less likely to be in the labour force if she lives in the Atlantic provinces, Quebec, or British Columbia than if she lives in Ontario or the Prairie provinces. And in whichever region she lives she is more likely to be in the labour force if she lives in a metropolitan centre than if she lives in a non-metropolitan centre.

Finally, the wife is, on the average, more likely to work when adults other than the head and the wife herself are part of the family unit than when no such "extra" adults exist; and she is less likely to work the older she gets.

For each of the factors mentioned we have what appears to be a statistically reliable basis for comment. The estimated impact of the various factors are highly significant, frequently at the one-half per cent confidence level.

In the course of arriving at the results discussed, we had initially included a dummy "tenure" variable in the equation to indicate whether the family owned its premises, rented, or "other". When the tenure and equity asset variables were included together the tenure variable was not statistically significant, and was accordingly dropped in the subsequent analysis. Our conclusion is therefore that the tenure variable is primarily a proxy for the family's equity assets position; once equity is accounted for directly the possible independent role for tenure as an indicator of home wages or tastes is not found to be statistically significant.

B. Analysis and Comparison of the Determinants of the Labour Force Participation Among the Several Age Groups

Thus far we have considered only the case of all age groups together. We now proceed to interpret the regression results for each of the several age groups separately, and to make comparisons among them. To look at the several age groups separately is especially important since the age factor alone tends to mask many other effects. For example, it is obvious that young children are typically found in homes with young wives. In addition there are numerous less obvious intercorrelations – e.g., between age and income, age and the several financial variables, and age and region of residence. One way to take into account such relationships is to incorporate "interaction" terms directly; an alternative is to consider each age group separately. The latter approach is adopted here. We consider first the financial and then the qualitative factors.

The Financial Factors

We use the regression results reported in Table 10 to calculate a measure of the responsiveness of the labour force supply of married women with respect to each of the several factors, and use these measures to compare their relative impacts. The measure we select is the percentage change in the dependent variable (in this case the probability that the married woman will be in the labour force) which will result from a one per cent change in the level of each explanatory variable (e.g., income, debts). This measure is called an elasticity.[36]

We find the measures of the wife's responsiveness to changes in the levels of the various explanatory factors in Table 12. Consider first the case of all age groups together (column 1). The number –.155 beside the income variable is the largest in the column. It suggests that a one per cent change in the level of income available to the family, exclusive of the wife's contribution, will reduce by .155 per cent the probability that she will be in the labour force.

[36] Greater detail on the elasticity measure and its calculation in this particular case is included in Appendix B.

TABLE 12. Measures of the Responsiveness of the Labour Force Participation of Married Women to Changes in the Level of the Several Financial Variables[1]

Variable	Age group						
	All ages	Less than 25	25-34	35-44	45-54	55-64	65 and over
Income of family, excluding earnings of wife	– .155	– .163	– .091	– .087	– .434	– .395	– .353
Short-term debt	.096	[2]	.029	[2]	.285	.282	[2]
Long-term debt	.067	[2]	[2]	.026	[2]	[2]	[2]
Liquid assets	– .010	[2]	[2]	– .068	[2]	[2]	[2]
Stocks	– .068	[2]	[2]	– .089	– .209	[2]	[2]
Other financial assets	– .081	[2]	[2]	[2]	[2]	[2]	[2]
Equity in real estate	– .035	[2]	– .019	[2]	– .007	– .045	[2]

[1] The measure of responsiveness is the **elasticity**. For further discussion of the concept see the accompanying text and Appendix B.

[2] Not recorded because the corresponding estimated regression coefficient suggests that the factor has no discernible impact on the labour force participation of the married woman.

Source: Calculated from Table 10.

The remaining figures are similarly interpreted. For example, a one per cent increase in the level of short term debts held by the family will increase by about 0.1 per cent the probability that the wife will be in the labour force. The figures suggest that the labour force participation of married women, in general, is rather more sensitive to the level of short term debt than long term debt. The difference, however, is not very large. Similarly it appears that the labour force participation of married women is rather more responsive to changes in the level of family holdings of stocks and other financial assets than to changes in the level of liquid assets and equity in real estate.

The Age Groups Separately

As we consider each of the age groups separately it is important to recall that some of the regression estimates on which the elasticity calculations are based are not themselves reliable. We cannot, therefore, place confidence in such results. In Table 12 we use the callnote [2] to indicate that the elasticity calculation would not be very reliable since the regression coefficient on which it would be based is not significantly different from zero at the five per cent level. In such cases we do not calculate the measure.

Less than 25. – The only value in which we can have confidence is the responsiveness of the labour force participation of married women in this age group to the family income. A one per cent increase in the family income (excluding the earnings of the wife) will reduce by about .16 per cent the probability that a married woman will be in the labour force.

Ages 25 - 34. – Of the various financial variables to which we find the labour force participation of married women in this age group responsive, the income factor is by far the most important. The holdings of short-term debts and equity are also significant, but much smaller in magnitude.

Ages 35 - 44. – The labour force participation of married women in the age group 35 to 44 is significantly influenced by more financial factors than any other age group. Since women in this age group are often past their childbearing years, it is especially interesting to learn which factors appear to be important in determining whether or not they tend to enter (or re-enter) the labour force. Our calculations suggest that current income, longer-term debt holdings, and asset holdings all have a significant impact. In particular, it appears that the labour force participation of a married woman in this age group is about equally sensitive to changes in the levels of family income, liquid assets and stock holdings. It is apparently much less influenced by holdings of debts, though, as indicated, the influence is nonetheless felt.

Ages 45-54.—Income, short-term debt holdings, and the level of holdings of stocks and of equity in real estate all appear to have an influence on the labour force participation of married women in this age group. Income is the financial factor to which the labour force participation is apparently most sensitive, although there is a suggestion that the level of short-term debt holdings has a rather substantial impact too, as has the holding of stocks. The influence of equity in real estate, while significant, is apparently relatively small.

Ages 55-64.—For married women in the age group 55 to 64 only income, short-term debt, and equity, among the various financial factors considered, appear to have significant impacts. Again we see that while the most important financial factor is the income level, the level of short-term debts also has a rather substantial impact. On the other hand, and consistent with the younger age groups and with all age groups together, the equity in real estate variable is found not to be a factor having a large impact on the wife's labour force participation though it nonetheless has a significant impact.

Ages 65 and over.—Finally we consider the oldest age group. Women over sixty-five would normally be retired from the labour force. Our regression results indicate that the only significant financial factor which persuades them otherwise is the level of current income available to the family. And it has a rather strong influence.

Comparisons Among the Age Groups

The **income** available to the family if the wife does not work is the only financial factor which proves to be a significant determinant of the labour force participation of married women in each of the age groups. Note that the impact of the income factor is least significant for women in their major child-bearing years (25 to 34 and 35 to 44). While it is relatively important for the youngest group of married women, it is substantially more important for women in the 45 to 54 and older age groups. Thus while income plays a dominant role in determining the labour force participation of married women of all ages, it has rather less impact during the major child-bearing years and a very large impact during the years following, when the wife has the option of entering (or re-entering) the labour force.

Of the two categories of **debt holding**—short-term and long-term—we find the short-term, in general, to be a rather more important factor. It appears that the importance of debts as a determinant of the wife's labour force participation grows as she becomes older. An older married woman

is apparently more likely to be in the labour force in order to help her family repay debts than is a younger married woman.

In general the level of **asset** holdings appears to have a small impact on the labour force participation of married women in any age group. Again, the impact which we detected tends to be more important for older married women than for younger.

The Qualitative Factors

In the above discussion we have made hypotheses regarding the role which various factors play in determining the labour force participation of married women. To this point we have found empirical support for most of our hypotheses. The support, however, is for the case in which we grouped together the married women of all ages and residence. We now turn to consider the same hypotheses in the case of each of the age groups separately. (See Table 10 for the regression results.)

Less than 25. – For women in this youngest age group the mean participation rate is relatively high. Of the qualitative factors the child status appears to be the most important determinant: a woman is markedly less likely to be in the labour force if she has a young child than if she has not.

Residence in a metropolitan area also appears to be an important factor – the inference is that a woman of similar other characteristics but living in a "metropolitan" rather than a "non-metropolitan" area is about 13.5 per cent more likely to be in the labour force. The differential is much greater than one might have thought a priori, but perhaps results in part from the lower fertility rates which exist for young married women in larger centres.[37]

Self-employment of the husband also provides a rather strong disincentive effect for the labour force participation of a young married woman. Again we note that this result may stem from the fact that wives of self-employed men are often unpaid family workers. Perhaps this status is particularly true in the case of younger married women. In any event, **SCF64** classified **unpaid family workers** as **not in the labour force.**

Ages 25-34. – Child status is apparently the primary determinant of the labour force participation of married women in the 25 to 34 age group. The presence of a young child is a very strong deterrent to her labour force participation; the presence of a child 6 to 14 is rather less of a deterrent, though still very important.

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[37] See Jacques Henripin, *Tendances et facteurs de la fécondité au Canada*, 1961 Census Monograph, (Ottawa: Queen's Printer, 1968), Tables 8-6, pp. 253-54.

Residence in a metropolitan area is an important factor. Our estimate indicates that a married woman with similar other characteristics, but living in a metropolitan area, is about 5 per cent more likely to be in the labour force. Again the measure may be picking up the differential fertility behaviour.

In addition we find the presence in the family of adults other than the husband and wife to be a significant determinant of the labour force participation of a married woman.

The regional factor, which encompasses a host of differences in employment possibilities, among others, also has significant explanatory power. A married woman in this age group who resides in the Atlantic region, Quebec or British Columbia is less likely to be in the labour force than a similar woman residing in Ontario or the Prairie provinces.

Ages 35-44. – By the time she reaches age 35 to 44 a married woman often finds that her children are in school. She is then more or less conspicuously faced with the choice of whether or not to be in the labour force, since her time is significantly freed by not having young children at home the whole day. It appears that for such women the employment status of the husband is a particularly important consideration. If he is unemployed she is about 13.6 per cent **more** likely to be in the labour force than if he is not. Similarly, if he is self employed she is about 13 per cent **less** likely to be in the labour force. In the former case her ability to supplement the family's income apparently plays a major role; in the latter case it may be her value in her husband's business as a readily available assistant which dominates, and she should properly be classified as an unpaid family worker. Perhaps, too, the self employed husband is typically least willing to have his wife working.

The child status factor remains a very important consideration. Married women in this age group who have youngsters at home experience a strong deterrent effect as a consequence.

Residence in a metropolitan area rather than a non-metropolitan area is apparently important for these women: with similar other characteristics a married woman is about 5 per cent more likely to be in the labour force if she lives in a metropolitan centre.

The regional influence remains important. Again, a married woman having similar other characteristics, but living in the Atlantic Provinces, Quebec or British Columbia is rather less likely to be in the labour force than one living in the Prairie provinces or Ontario.

Ages 45-54. – The employment status of the husband is an important determinant of the labour force participation of married women between the ages of 45 and 54. If he is unemployed she is about 15 per cent more likely to be in the labour force than if he is an employee.

While her child status remains an important factor, it is one which is losing relatively. Rather few young children are present in these families, as is evidenced by the omission of the second child status category (presence of children less than 6). While such young children as are present typically have older brothers or sisters, they do continue to serve as a major deterrent to their mother's labour force participation, as is evidenced by the strength of the relevant coefficient (−0.226).

The presence of other adults in the family appears to be an important factor again, in general apparently freeing the mother from her child care duties.

Finally, as before, the region of residence and the size of the centre both appear to be important factors.

Ages 55-64. – We have mentioned that the level of current income is a major factor influencing the labour force participation of married women in this pre-retirement age group. On analysing the qualitative factors it appears that we have isolated only the region of residence as an additional factor having a significant impact. Clearly the child status factor has ceased to be a cause for concern as has the employment status of her husband. We consider the region of residence factor at greater length below.

Ages 65 and over. – Our analysis indicates that the sole factor causing a woman in her post-retirement years to be in the labour force is current income or income related. Thus in addition to the influence of the current income level we find among the qualitative factors that if the husband is unemployed the wife is significantly more likely to be either working or seeking work than if he is not.

Summary of Qualitative Factors: Comparisons Among Age Groups

The above analysis of the qualitative factors by age group has turned up many results, which we now attempt to summarize.

The influence of the **labour force status of the husband** varies markedly from one age group to another. In general it appears that if the husband is unemployed the wife is rather more likely to be in the labour force the older she is. Perhaps the explanation is that relatively young women are more likely to have young children and feel that they are not available to supplement the family income except in the most extreme

cases. However by the time the wife is 35-44 relatively few pre-school children are left in the home, and she is more able to opt for labour force participation if there is reason. This line of reasoning is entirely consistent with the additional worker hypothesis noted earlier: married women without young children are **less** marginal members of the labour force than married women with young children.

The **child status** factor clearly dominates the labour force behaviour of the married woman in all age groups for which it is a relevent consideration. The presence of a pre-school child in the family reduces very substantially the probability that a married woman will be in the labour force – and this is true whether only pre-school children are in the family, or whether there are also older children who might, to an extent, serve as a babysitter. If all children are old enough to be in school the disincentive effect of the child status factor is much weaker, and, in some instances, there is even the suggestion that the presence of children of high school age provides an incentive for the mother to be in the labour force. Presumably child care duties would be rather small and could, in any event, be allocated to evenings and the weekend.

The presence in the family of **adults other than the husband and wife** tends on average, to facilitate the labour force participation of the married woman. It is not obvious that such would be the case: an "extra" adult in the family could, on average, require as much attention as a young child. However we find the dominant effect to favour the labour force participation of the wife.

Residence in a **metropolitan** area increases the likelihood that the married woman will be in the labour force. Clearly the variable is catching up a wide variety of factors – among which are attitudes towards work and perhaps the differential fertility patterns and rates of married women in centres of varying sizes.

The **region of residence** similarly catches up a host of differences in attitudes, religious affiliation, and general background as we move from one part of the country to another. In general there appears to be strong evidence, both for all ages together and for the age groups separately, that a married woman is much less likely to work if she lives in the Atlantic provinces or Quebec and slightly less likely if she lives in British Columbia, than if she lives in Ontario or the Prairie provinces. We turn in a moment to analyse this factor rather more closely.

But first we present a summary statement, in Chart 3, of the importance of the age factor as a determinant of the wife's labour force participation. One plot is of the actual participation rates, by age, which were observed in the **SCF64** sample. The second plot is the "adjusted"

participation rate—adjusted for income, asset and debt holdings, child status, and all the other qualitative factors. That is, the "adjusted" participation rate schedule uses our regression results for each of the several age groups, and predicts what the participation rate would be if nothing but age were permitted to vary.[38]

The comparison is very striking. The observed rates record a substantial dip in the extent of labour force participation during the major child-bearing years, followed by a temporary increase and then a steady fall. The adjusted rates, on the other hand, show a steady fall from age 30. The gaps between the adjusted and observed rates fall into two or perhaps three distinguishable portions. The first is up to about age 45.

During the first phase the major difference between the adjusted and the predicted values results from the adjustment for child status. This factor alone dominates the relationship, but to an increasingly lesser extent as the wife approaches age 45.

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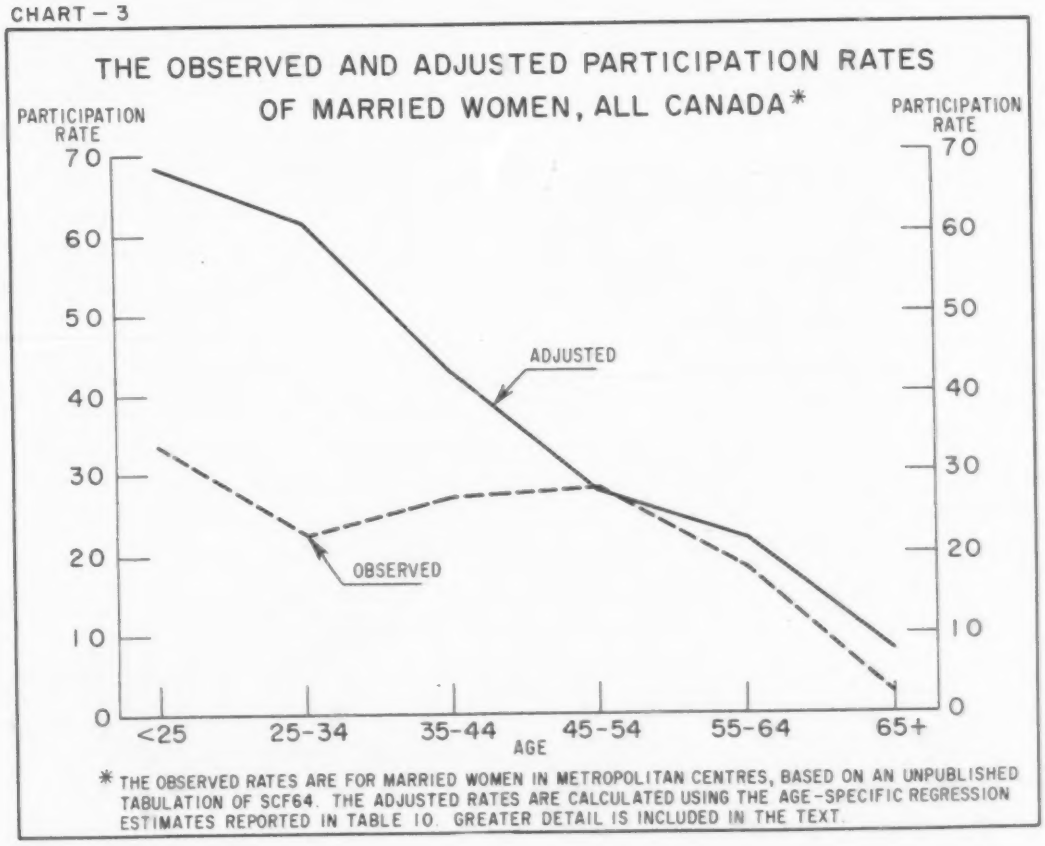
[38] The values employed for the continuous variables are the sample means, reported in Table B-1. The dummy variable characteristics assumed to pertain are: no children, no adults in the family other than the husband and wife and metropolitan residence in Ontario.

CHART – 3



The second phase is above age 45. During this phase the "adjusted" income, asset and debt holdings, and the several qualitative factor adjustments – most notably, child status – tend to be very close to the observed levels. Thus the observed and adjusted rates are very close.

Perhaps a third phase could be distinguished, from age 60 on. While asset holdings tend to be above average and the debt holdings below average (and thus to suggest a lower adjusted than observed participation rate) the observed income is below the average for all ages. Since it is the income factor which dominates this phase we find at least a slight tendency for the adjusted participation rates to be above the observed.

Regional Differentials in Labour Force Behaviour: The Age Dimension

While it is clear from the results reported in Table 10, and from the above analysis, that substantial regional differences exist in the labour force behaviour of married women it is not obvious what pattern, if any, may exist when the age groups are considered separately.

In order to answer the question of whether a clear pattern exists in the regional differences in the labour force participation rates of married women we measure the ratio of the regional factor to the mean participation rate for the age group. We report this calculation in Table 13 for the cases where the estimated regional influence as reported in Table 10 is significantly different from our standard case (Ontario).

When considering all ages together it appears that as compared to Ontario, the regional differences are relatively important in Quebec and the Atlantic Provinces, and rather less important in British Columbia. The various factors caught up in the regional measure are apparently about the same in the Prairie Provinces as they are in Ontario.

Once we look at the separate age groups, however, interesting things emerge. First, it is clear that the regional factors *per se* have no significant influence on the labour force behaviour of married women less than 25: in no case does the regional factor differ significantly from Ontario.

For the next age group – 25 to 34 – the importance of the regional factor is apparent, but relatively weak. For older age groups the regional factor appears to gain weight in the case of the Atlantic Provinces and Quebec, but to wash out in the case of British Columbia and never to become apparent in the case of the Prairie Provinces.

Thus our analysis indicates that the younger married women having similar characteristics are equally likely to be in the labour force regardless of the region in which they live. If the attitudes of the currently

young towards participation in the labour force do not change as they grow older then the importance of the "regional" influences which we have noted may well weaken over time.

TABLE 13. Estimated Impact of the Regional Factor as a Per Cent of the Mean Participation Rate of Married Women, by Age Group

Region	Age group						
	All ages	Less than 25	25 - 34	35 - 44	45 - 54	55 - 64	65 and over
Atlantic	41.0	[1]	43.2	36.0	59.0	116.8	210.7
Quebec	53.3	[1]	30.5	76.1	59.8	73.7	[1]
Prairies	[1]	[1]	[1]	[1]	[1]	[1]	[1]
British Columbia	29.7	[1]	36.8	42.8	[1]	[1]	[1]
Mean participation rate, Canada	21.2	28.4	19.0	25.0	24.9	16.7	2.8

[1] The estimated impact is not significantly different from Ontario.

Source: Derived from Table 10, using the mean values reported in Table B1.

VII. METROPOLITAN AND NON-METROPOLITAN AREAS COMPARED

In Tables 14 and 15 we record the regression analysis for metropolitan and non-metropolitan areas respectively. The same hypotheses are implicit in these equations as in those in Table 10, and the interpretation can proceed along similar lines.

Rather than undertake a detailed interpretation of the results we present a summary of highlights, and leave a closer inspection to the interested reader.

TABLE 14. Analysis of the Labour Force Participation of Married Women, Canada, Metropolitan

Variable or attribute	Age group		
	All ages	Less than 25	25-34
Total income of family, excluding earnings of wife	.393[1]	.780[5]	.484[1]
Financial variables:			
Debts:			
Short term	-.092[1]	-.064[4]	-.025[4]
Long term	-.093[1]	-.120[4]	-.057[4]
Assets:			
Liquid	.137	-.523[4]	.444
Liquid, squared	-.202[5]	.173[4]	-.499[5]
Stocks	.076[5]	-.003[4]	.135
Other financial	.112[3]	.174[4]	.085[4]
Equity in real estate	.106[1]	.080[4]	.106[2]
Misreported stocks	.017[4]	.233[4]	.044[4]
Labour force status of husband:			
Unemployed	.206[1]	.085[4]	.151[2]
Self-employed	-.065[3]	-.270[5]	.011[4]
Employed[6]	[6]	[6]	[6]
Child status:			
No children[6]	[6]	[6]	[6]
All children less than 6 years	-.304[1]	-.389[1]	-.397[1]
All children aged 6-14 years	-.041	--	-.257[1]
All children aged 15-16 years	.006[4]	--	--
All children aged 17-19 years	.036[4]	--	--
Children less than 6 plus other children	-.257[1]	-.377[1]	-.428[1]
All children 6 years or older	-.069[5]	--	--
Presence of other adults in family	.077[1]	.145	.119[5]
Region of residence:			
Atlantic	-.133[1]	-.036[4]	-.174[3]
Quebec	-.106[1]	-.098	-.080[5]
Ontario[6]	[6]	[6]	[6]
Prairie	.005[4]	.002[4]	.034[4]
British Columbia	-.047[2]	-.022[4]	-.083
Age of wife	10.929[1]		
Common term	-.070	.660	.269
$\bar{R}^2$	.1281	.1837	.1598

See footnotes at end of table.

TABLE 14. Analysis of the Labour Force Participation of Married Women Canada, Metropolitan – Concluded

Variable or attribute	Age group			
	35-44	45-54	55-64	65 and over
Total income of family, excluding earnings of wife	.359[1]	.743[1]	.731[1]	.220[5]
Financial variables:				
Debts:				
Short term	-.010[4]	-.221[1]	-.246[3]	-.006[4]
Long term	-.054	-.044[4]	.022[4]	-.116[3]
Assets:				
Liquid	.307	-.286	-.152[4]	-.273[2]
Liquid, squared	-.237	.168[4]	-.053[4]	.189
Stocks	.135[2]	.098	.010[4]	.014[4]
Other financial	.145	.125	.106	-.015[4]
Equity in real estate	.014[4]	.103[2]	.129[5]	.002[4]
Misreported stocks	.137[4]	-.078	-.178	-.031[4]
Labour force status of husband:				
Unemployed	.370[1]	.237[3]	-.051[4]	-.018[4]
Self-employed	-.150[1]	-.041[4]	-.054[4]	-.058[4]
Employed	[6]	[6]	[6]	[6]
Child status:				
No children	-.310[1]	--	--	--
All children less than 6 years	-.161[1]	-.063	--	--
All children aged 6-14 years	-.050[4]	.035[4]	--	--
All children aged 15-16 years	.161	-.007[4]	.043[4]	--
All children aged 17-19 years	-.360[1]	-.220[5]	--	--
Children less than 6 plus other children	-.129[5]	-.113[5]	-.058[4]	--
All children 6 years or older	.014[4]	.091[2]	.079	.006[4]
Presence of other adults in family				
Region of residence:				
Atlantic	-.120[2]	-.203[3]	-.205[5]	.087
Quebec	-.147[1]	-.113[3]	-.130[3]	.014[4]
Ontario	[6]	[6]	[6]	[6]
Prairie	-.015[4]	.098[2]	-.066	-.043
British Columbia	-.092[2]	-.003[4]	-.025[4]	-.037[4]
Age of wife				
Common term	.162	.226	.196	.151
$\bar{R}^2$	.1651	.0942	.0890	.0177

[1] Significant at 0.5% level.
[2] Significant at 5% level.
[3] Significant at 1.0% level.
[4] Standard error exceeds regression coefficient.
[5] Significant at 2.5% level.
[6] This category is constrained to zero for statistical reasons. See Appendix C.

TABLE 15. Analysis of the Labour Force Participation of Married Women, Canada, Non-Metropolitan

Variable or attribute	Age group		
	All ages	Less than 25	25-34
Total income of family, excluding earnings of wife	.162[5]	-.301[4]	.393[3]
Financial variables:			
Debts:			
Short term	-.110[1]	-.025[4]	-.143[3]
Long term	-.089[1]	.010[4]	-.072
Assets:			
Liquid	.106[4]	-.225[4]	-.002[4]
Liquid, squared	-.219[2]	.039[4]	-.198[4]
Stocks	.057	.371	-.192
Other financial	.082	2.334[5]	.214
Equity in real estate	.050[2]	.073[4]	.054
Misreported stocks	-.325	--	-.741[5]
Labour force status of husband:			
Unemployed	.067[2]	.012[4]	.005[4]
Self-employed	-.027[4]	.115[4]	-.045[4]
Employed	[6]	[6]	[6]
Child status:			
No children	[6]	[6]	[6]
All children less than 6 years	-.200	-.157[5]	-.589[1]
All children aged 6-14 years	-.014	--	-.419[1]
All children aged 15-16 years	.065	--	--
All children aged 17-19 years	.066	--	--
Children less than 6 plus other children	-.147[1]	.105[4]	-.570[1]
All children 6 years or older	.007[4]	--	--
Presence of other adults in family	.050[5]	.075[4]	-.032[4]
Region of residence:			
Atlantic	-.051[2]	.080[4]	.004[4]
Quebec	-.128[1]	-.047[4]	-.013[4]
Ontario	[6]	[6]	[6]
Prairie	.018[4]	.058[4]	.058
British Columbia	-.093[1]	-.013[4]	-.033[4]
Age of wife	7.115[1]		
Common term	.078	2.417	.821
$\bar{R}^2$	.0785	.0201	.1799

See footnotes at end of table.

TABLE 15. Analysis of the Labour Force Participation of Married Women, Canada, Non-Metropolitan – Concluded

Variable or attribute	Age group			
	35-44	45-54	55-64	65 and over
Total income of family, excluding earnings of wife	-.092[4]	.261[2]	.101[4]	.317[3]
Financial variables:				
Debts:				
Short term	-.176[5]	.012[4]	-.166	-.687[4]
Long term	-.023[4]	-.148[5]	-.033[4]	.034[4]
Assets:				
Liquid	.427	-.378[4]	-.195[4]	.194[4]
Liquid, squared	-.453	.176[4]	.081[4]	-.201
Stocks	.167	.256	.080[4]	-.208[1]
Other financial	.075[4]	.144	.102[4]	.033[4]
Equity in real estate	.015[4]	.101	-.061[4]	-.021[4]
Misreported stocks	-.472	--	-.319[4]	--
Labour force status of husband:				
Unemployed	.054[4]	.086[4]	.098[4]	.453[1]
Self-employed	-.106	-.013[4]	.079[4]	-.029[4]
Employed	[6]	[6]	[6]	[6]
Child status:				
No children	-.101[4]	--	--	--
All children less than 6 years	-.061[4]	-.174[5]	--	--
All children aged 6-14 years	.027[4]	-.002[4]	--	--
All children aged 15-16 years	.153[4]	.017[4]	-.018[4]	--
All children aged 17-19 years	-.201[3]	-.158	--	--
Children less than 6 plus other children	-.053[4]	-.043[4]	-.091[4]	--
All children 6 years or older	.040[4]	.015[4]	-.012[4]	.031[4]
Presence of other adults in family	-.078	-.097	-.162[2]	.048
Region of residence:				
Atlantic	-.244[1]	-.186[1]	-.096	.001[4]
Quebec	[6]	[6]	[6]	[6]
Ontario	-.010[4]	-.053[4]	.076[4]	.023[4]
Prairie	-.169[2]	-.140	-.217[2]	.009[4]
British Columbia				
Age of wife	.276	.104	.257	.106
Common term	.1094	.0498	-.0040	.1080
$\bar{R}^2$				

[1] Significant at 0.5% level.
[2] Significant at 5% level.
[3] Significant at 1.0% level.
[4] Standard error exceeds regression coefficient.
[5] Significant at 2.5% level.
[6] This category is constrained to zero for statistical reasons. See Appendix C.

In Table 16 we present the observed participation rates in our survey for each of the age groups, for "All" and for "Metropolitan" and "Non-Metropolitan". We note, in general, and consistent with the earlier results, that the participation rates are substantially higher in metropolitan centres. Below we find that the metropolitan case has dominated our results in the sense that while we are able to explain much of the labour force behaviour of married women in the "All Canada" category, and in metropolitan centres, we have little success explaining their behaviour in non-metropolitan areas.

TABLE 16. Observed Participation Rates (Per cent) in the SCF Sample, All Canada, Metropolitan Areas, and Non-metropolitan Areas

Age	All	Metropolitan	Non-metropolitan
TOTAL	**21.3**	**24.2**	**16.1**
Less than 25	28.4	33.7	19.2
25 - 34	19.0	22.3	13.4
35 - 44	25.0	27.1	21.2
45 - 54	24.9	28.0	18.8
55 - 64	16.7	18.3	13.8
65 and over	2.8	2.7	2.8

Source: Unpublished tabulations from **SCF64.**

Current Income of the Family

We found the current income available to the family, exclusive of earnings of the wife, to be a very important determinant of the labour force participation of a married woman in each of the age groups separately as well as all ages combined. The same statement holds true for married women in metropolitan areas, but appears less true for those in non-metropolitan areas.

Financial Variables

In general the pattern which we found for the influence of the family's stock of assets and debts on the labour force participation of the wife is consistent with the results for married women in metropolitan centres. The impact of these financial factors in non-metropolitan areas appears much less strong.

Labour Force Status of the Husband

Again, the pattern of influence which the employment status of the husband has on the labour force participation of the wife in the "All Canada" case is consistent with the influence apparent on women living in metropolitan centres. The impact of the employment status of the husband on the labour force participation of married women living in non-metropolitan centres is in general much weaker.

Child Status

The dominant influence which the presence of young children has on the labour force behaviour of the married woman holds true in the metropolitan and non-metropolitan centres separately as well as together. Again, however we note that while the child status factor remains, in general, strong in non-metropolitan areas, the effect is much weaker than is the case in metropolitan areas. The result is consistent with previous work[39] where it was suggested that the costs of substitutes for the mother's care tend to be rather less the smaller the centre, and that relatives and neighbours tend to be more available for child care during the day in smaller centres.

Other Adults in Family

The presence in the family of adults other than the husband and wife, on balance, appears to facilitate the labour force participation of the wife. We note that the effect appears stronger in metropolitan centres than in non-metropolitan areas. This result is consistent with our comment on the relative availability of substitutes for the attention of the mother in larger and smaller centres.

Regional Influences

In the "All Canada" case we noted that regional factors appear to have an important impact on the labour force participation of married women. Furthermore, the impact tended to be greater the older the age of the wife.

For the metropolitan and non-metropolitan areas separately the outcome is similar. However, and perhaps contrary to one's intuition, the regional factors appear rather more important for married women living in metropolitan centres. Nonetheless, the finding is consistent with our earlier remarks that the shorter distances and greater availability of informal day-care facilities experienced in smaller centres may have a substantial bearing on married female participation rates.

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[39] Allingham and Spencer, *op. cit.*, pp. 15 and following.

Summary Remarks

Married women residing in metropolitan centres appear to be much more influenced in their labour force behaviour by the factors considered in this study than do married women in non-metropolitan areas. This conclusion is supported not only by the analysis of the estimated coefficients for each of the categories separately, but also by the fact that the equation as a whole has much more explanatory power in the metropolitan case than in the non-metropolitan case. This is indicated by both the F-test and the coefficient of determination (R-bar squared), reported in the tables.

We turn now to our second method of analysing the survey data – dummy variable regression analysis – and to consider the estimates obtained by this alternative method in the light of the above discussion.

VIII. AN ALTERNATIVE FORMULATION OF THE MODEL – THE USE OF DUMMY VARIABLES

Basic Equation in the Dummy Variable Regressions

The alternative to the part-continuous-part-dummy variable model is the full dummy variable model. As before, the qualitative factors are represented as dummy variables. In addition we convert the continuous variables to dummy variables by arbitrarily dividing their ranges into subranges for which dummy variables are defined. In this fashion all the explanatory factors are represented by dummy variables. The dependent variable continues to be represented as a dummy variable.[40]

One advantage in the use of the full dummy variable specification is that no assumption need be made about the shape of the effect of the regressors: the dummies will conform to any curvature that is present. Thus the path of the expectation of the regression is free to vary in response to variation in the explanatory variables, but with the restriction that the function remains flat over the various ranges of the explanatory variables.

The case is illustrated in Chart 4, which is to be compared with Chart 2(b) above. In Chart 2 we suggest that the "real" relationship between the income of the head, Y_h, and the labour force participation of the wife, $_p$, which we are attempting to estimate, is represented by the continuous line, CC. In the above empirical work we have made more-or-less plausible assumptions about such relationships. In the present analysis we need not specify the functional form. Instead, having subdivided continuous variables into subranges we proceed to estimate the impact of each of those subranges separately. The estimates produced are the bars in Chart 4. In this way the estimation procedure yields information on the linearity or non-linearity of the relationship without requiring that the form first be specified.

As an example of the procedure involved in converting a continuous variable to a dummy variable consider the variable income. Assume it is the third factor, and refer to it as $X^{(3)}$. Suppose we were to define five subgroups, $X_1^{(3)}$, $X_2^{(3)}$, $X_3^{(3)}$, $X_4^{(3)}$, and $X_5^{(3)}$ where for example,

$X_1^{(3)}$ = 1 when actual value is 0
0 otherwise

---

[40] A regression equation with all the independent and dependent variables represented by dummy variables is called a linear probability function; the expected value of the dependent variable is a linear function of the independent variables. Some technical aspects of this particular form of regression equation are discussed in Appendix C.

$X_2^{(3)}$ = 1 when actual value is in interval \$1 to \$999
0 otherwise

$X_3^{(3)}$ = 1 when actual value is in interval \$1,000 to \$1,999
0 otherwise

$X_4^{(3)}$ = 1 when actual value is in interval \$2,000 to \$4,999
0 otherwise

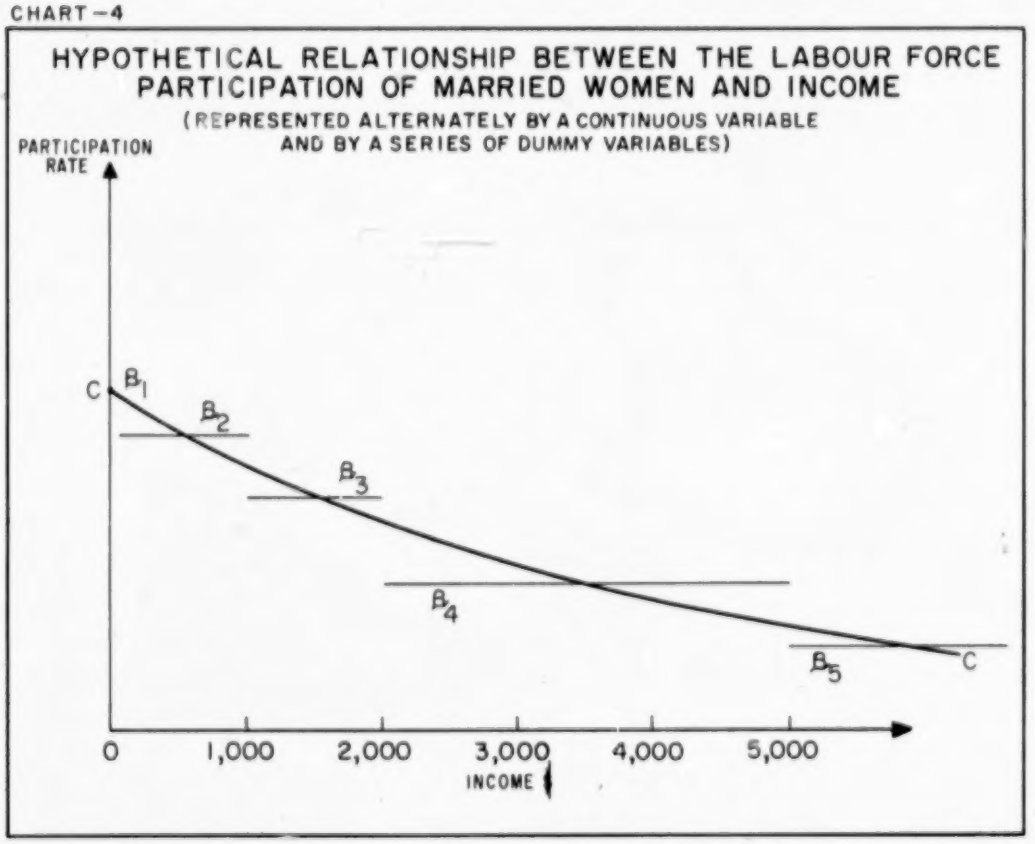
$X_5^{(3)}$ = 1 when actual value is greater than \$5,000
0 otherwise

We would then estimate the relationship for each of the subgroups,

$$\beta_1 X_1^{(3)} + \beta_2 X_2^{(3)} + \ldots + \beta_5 X_5^{(3)}$$

where the β's correspond to the bars in Chart 4.

CHART–4



Empirical Investigations

Using the above technique, in our analysis we have represented all fourteen of the factors under consideration by dummy variables. While the process of selecting the dummy variables to represent each of the con-

tinuous variables is largely arbitrary there is a high degree of expectation and uniformity in the decisions. We leave for the moment any direct consideration of the dummy variable sub-groups, and turn instead to a measure of the relative importance of each of the fourteen dummy variable groupings in the all observations case, for all ages and for each of the age groups. The measure which we apply to estimate the relative importance of the dummy variable categories is the beta coefficient. This coefficient has the desirable characteristic that the larger its magnitude the greater the importance of the explanatory factor under consideration.[41]

As in our previous analysis we have estimated seven regression equations using the all area data. The first equation is for all ages while the remaining regressions control for age. The resulting beta coefficients are presented in Table 17.

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[41] In fact, it has, on occasion, been called an "importance factor". See, for example, James N. Morgan, "Housing and Ability to Pay", Econometrica, April, 1965, p. 297.
Greater discussion on the calculation of the beta coefficient and comparisons of its properties with possible alternatives is provided in Appendix C.

TABLE 17. Beta Coefficients Calculated from the Dummy Variable Regressions, All Observations

Factor	Age Group						
	All ages	Less than 25	25-34	35-44	45-54	55-64	65 and over
Child status	.327	.318	.328	.268	.136	.031	--
Family income less wife's earnings	.196	.149	.205	.167	.220	.303	.255
Region	.116	.062	.098	.156	.168	.174	.135
Liquid assets	.121	.167	.149	.110	.095	.215	.145
Short-term debt	.064	.105	.084	.078	.097	.130	.239
Equity	.078	.087	.096	.047	.139	.116	.025
Long-term debt	.079	.035	.103	.081	.097	.058	.211
Stocks	.027	.087	.027	.063	.078	.143	.187
Other financial assets	.045	.064	.062	.076	.075	.150	.113
Metropolitan	.051	.099	.045	.047	.049	.000	.040
Adults	.092	.035	.071	.047	.066	.060	.002
Head self-employed	.039	.066	.006	.084	.022	.017	.116
Head unemployed	.011	.001	.001	.008	.011	.057	.178
Age of wife	.305						

The beta coefficients for the all ages regression show the extreme importance of the child status factor and of the age of the wife variables, and justify the use of the age-specific regressions. Since some of the independent variables add little to the explanation of the dependent variable, we decided to use the beta coefficients to provide a rough guide in the selection of the five most important factors. On this basis the five factors which we select, in order of importance, are child status, family income (exclusive of the wife's earnings), liquid assets, region, and long-term debt.

Child status is by far the most important factor. Its beta coefficient is largest in three age groups, fourth in another and first in the all-age group. The family income factor ranks second; it is the largest in the three oldest groups, second in two, and third in the all-age group. The third factor is liquid assets whose importance in the age regressions ranges from second to seventh and is fourth in the all-age group. The next factor is region, which varies from second to tenth in the age regressions and is fifth in the all-age group. The last factor is long-term debt whose importance varies from third to eleventh in the age regressions and is seventh in the all-age group. If a sixth factor was chosen it would be a "toss-up" among equity, short-term debt, and the presence of other adults.

Table 18 records the estimated coefficients for the five most important factors for the all-ages case, and for each of the separate age groups. In the case of all ages we had 14 factors represented by 54 independent (dummy) variables. When we control for age we are left with 13 factors which, in turn, are represented by a varying number of dummy variables, depending on which child status variables are estimable.

Interpretation of Table 18

In Table 18 we present the transformed regression coefficients for the seven equations. Consider the **all ages** regression estimates recorded in the first column. As a result of the estimation procedure employed the first row is the mean of the dependent variable, in this case the average labour force participation rate for all women in our sample.[42]

To find the influence of a factor on the probability that a woman will be in the labour force we locate the figure on the row corresponding to the particular characteristic of the factor under consideration. For example,

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[42] The constraining technique used in the regression estimation is to let weighted sum of the coefficients equal zero since this technique implies that the constant term is equal to the mean value of the dependent variable. The latter feature is very useful in interpreting the results in Table 18. Further consideration of the technique, and discussion of alternatives, is provided in Appendix C.

TABLE 18. Dummy Variable Analysis of the Labour Force Participation of Married Women, Canada

Variable group	Age groups		
	All ages	Less than 25	25-34
Mean of dependent variable	21.3	28.4	19.0
Family income less wife's earnings:			
$ 0-$1,999	14.1	13.1	6.8
2,000- 2,999	6.8	2.5	11.5
3,000- 3,999	5.2	- 0.2	8.3
4,000- 4,999	1.9	- 1.5	1.5
5,000- 5,999	0.9	0.1	2.7
6,000- 6,999	- 4.5	- 2.3	- 8.9
7,000- 9,999	- 7.8	- 26.1	- 11.2
10,000+	- 17.5	- 15.7	- 16.6
Child status:			
No children	15.9	20.6	37.0
All children less than 6 years	- 15.3	- 10.6	- 5.8
All children aged 6-14 years	3.2		11.2
All children aged 15-16 years	9.1		
All children aged 17-19 years	12.9		
Children less than 6 plus other children	- 15.3	4.6	- 5.9
All children 6 years or older	1.2		
Region of residence:			
Atlantic provinces	- 3.6	4.6	- 4.8
Quebec	- 6.2	- 4.1	- 3.8
Ontario	4.1	1.1	3.0
Prairie Provinces	5.3	2.6	5.8
British Columbia	- 1.8	- 1.4	- 2.4
Liquid assets:			
$ 0	- 8.2	- 7.2	- 9.3
1-$ 499	0.0	- 0.6	0.9
500- 999	2.8	12.3	5.7
1,000- 1,999	4.8	18.6	9.7
2,000+	8.3	27.5	8.4
Long-term debts:			
$ 0	- 2.3	- 0.3	- 2.6
1-$2,499	1.2	3.8	- 3.4
2,500- 4,999	2.5	0.3	6.6
5,000- 7,499	3.3	7.9	- 1.1
7,500- 9,999	8.0	0.2	6.9
10,000+	4.7	- 2.2	6.1
Age of wife:			
Less than 25 years	9.6		
25-34 years	9.2		
35-44 "	6.6		
45-54 "	- 4.1		
55-64 "	- 17.1		
65 or more	- 32.5		
$\bar{R}^2$	.14	.14	.17

TABLE 18. Dummy Variable Analysis of the Labour Force Participation of Married Women, Canada – Concluded

Variable group	Age group			
	35-44	45-54	55-64	65 and over
Mean of dependent variable	25.0	24.9	16.7	2.8
Family income less wife's earnings:				
$ 0-$1,999	17.7	25.2	13.9	2.5
2,000- 2,999	6.7	6.5	11.5	4.1
3,000- 3,999	7.4	1.2	9.5	- 3.8
4,000- 4,999	2.5	7.3	- 6.7	- 1.2
5,000- 5,999	1.8	- 0.4	0.7	3.3
6,000- 6,999	1.4	- 1.9	- 10.8	- 3.9
7,000- 9,999	- 7.6	- 1.9	- 1.6	- 6.3
10,000+	- 13.5	- 17.5	- 18.3	- 9.4
Child status:				
No children	17.4	4.9	0.3	
All children less than 6 years	- 9.2			
All children aged 6-14 years	3.6	- 4.2		
All children aged 15-16 years	11.3	6.3		
All children aged 17-19 years	33.5	4.3	0.3	
Children less than 6 plus other children	- 12.6	- 15.5		
All children 6 years or older	5.2	- 4.7	- 5.0	
Region of residence:				
Atlantic provinces	- 2.4	- 7.1	- 14.6	5.7
Quebec	- 9.4	- 9.0	- 5.0	0.1
Ontario	6.2	5.4	5.7	- 1.6
Prairie Provinces	5.5	9.4	4.3	1.4
British Columbia	- 3.0	- 0.4	0.9	- 2.0
Liquid assets:				
$ 0	- 8.8	- 5.8	- 9.2	- 3.4
1-$ 499	1.9	- 0.6	- 7.7	0.2
500- 999	1.8	- 0.7	7.8	- 1.6
1,000- 1,999	- 0.1	2.7	5.8	- 0.4
2,000+	8.6	8.6	8.9	3.4
Long-term debts:				
$ 0	- 3.0	- 3.1	- 0.7	- 0.4
1-$2,499	4.1	1.8	- 0.5	- 0.2
2,500- 4,999	- 1.4	5.9	2.8	- 5.7
5,000- 7,499	4.8	8.4	- 4.0	- 0.7
7,500- 9,999	6.1	5.4	8.5	12.7
10,000+	2.5	5.5	3.2	28.5
Age of wife:				
Less than 25 years				
25-34 years				
35-44 "				
45-54 "				
55-64 "				
65 or more				
$\bar{R}^2$	.15	.08	.07	.08

if the family income less the wife's earnings is in the interval $6,000-$6,999, then we can say that the probability the wife is in the labour force is 4.5 per cent less than average, or 16.8 per cent. We can continue in this fashion and determine for a particular family the probability of the wife being in the labour force given the particular characteristics of family income, child status, region, liquid assets, long term debt, and age of wife. Thus, we estimate the probability that a 28 year old wife would be in the labour force when the family income is $6,500, when there is present one child under 6, when the family lives in Ontario, has liquid assets of $800, and no long term debt to be 15.3 per cent (21.3 – 4.5 – 15.3 + 4.1 + 2.8 – 2.3 + 9.2).

The Five Factors

We now take a detailed look at the five most important influences on the labour force participation of married women in the all-ages regression. The beta coefficients suggest that the most important factor is **child status.** In particular, a married woman with no children is 15.9 per cent more likely than average to be in the labour force while a married woman with children under 6 years of age is 15.3 per cent less likely. These extreme cases thus have influences of similar magnitude but opposite direction. The results also indicate that whether a family has only young children, or has older children as well is a matter of little significance in terms of its influence on the labour force decision of the wife: she is equally unlikely to be in the labour force in either case. The presence of older children alone increases the probability that a married woman will be in the labour force; the older they are the more likely she is to be in the labour force. These results are entirely consistent with those obtained using a combination of dummy variables and continuous variables.

The second most important factor in determining a wife's labour force participation is the **family income less the wife's earnings.** The eight coefficients show that this measure of income has an inverse relationship with the probability of the wife being in the labour force. In Chart 5(a), we plot both the dummy variable and the continuous variable estimates of the influence of income. Clearly there is a broad agreement between the two in the pattern of the results, such that neither is strongly preferred.[43]

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[43] In particular, we find no temporary sharp reduction on the estimated impact of income on the wife's labour force behaviour over low income levels, followed by a sharp rise and then a gradual decline. Such a pattern of impact was noted in William G. Bowen and T. Aldrich Finegan, *The Economics of Labour Force Participation*, (Princeton, 1969), pp. 140-1, who explain the temporary trough "in terms of the distribution of welfare payments among income classes".

The third factor is **liquid assets** and the five dummy variable coefficients show a positive relationship between this factor and labour force participation by the wife. In Chart 5(b), we plot both the dummy variable and the continuous variable estimates of the influence of short-term assets on the labour force participation of the wife. The dummy variable results suggest a positive relationship between the family's stock of short-term assets as cause and the labour force participation of the wife as effect. This result would not be consistent with our hypothesis that the greater the stock of such assets the less likely the wife is to be in the labour force. The continuous variable version also suggests that there is a positive relation if the stock of short-term assets is fairly small, but one which turns down for higher values of stock holdings. In view of the high average value of short-term asset holdings it is perhaps unfortunate that the final dummy variable category was not subdivided.

The fourth factor is the **region** of residence. The Ontario and Prairie provinces variables have nearly equal influences yielding higher than average probabilities that the wife will be in the labour force. On the other hand, British Columbia, the Atlantic provinces, and Quebec have increasingly large negative influences on the wife's participation. The interpretation of the dummy variable results is thus completely consistent with the part-dummy variable, part-continuous variable case.

The fifth factor is the **long-term debt** position of the family. If the family does not have any long-term debt then the probability of the wife being in the labour force is less than average while there is a positive relationship between this factor and her participation in the labour force if such debt exists. In Chart 5(c) the plot of estimates obtained using the alternative representations of the independent variable indicates substantial agreement in the results.

In Chart 6 we plot the estimated impact of the continuous variables (a) short-term debts, (b) other financial variables, (c) equity in real estate, and (d) stock holdings, on the labour force participation rate of married women. For these four cases the dummy variable regression coefficients have not been reported on the grounds that the measure of their importance (the beta-coefficients) was small.

In each case the plot in Chart 6 is consistent with the suggestion that the impact of any one of these factors on the labour force participation of the wife is small: the plots are not far removed from being horizontal lines. We note, however, that each is consistent with our hypotheses regarding their impact: the asset variables (b,c,d) each have a negative, while small, impact on the wife's labour force participation, and the debt variable (a) has a positive, though small, impact.

CHART – 5

THE ESTIMATED IMPACT OF VARIOUS FINANCIAL VARIABLES ON THE LABOUR FORCE PARTICIPATION OF MARRIED WOMEN, USING DUMMY VARIABLES AND CONTINUOUS VARIABLES

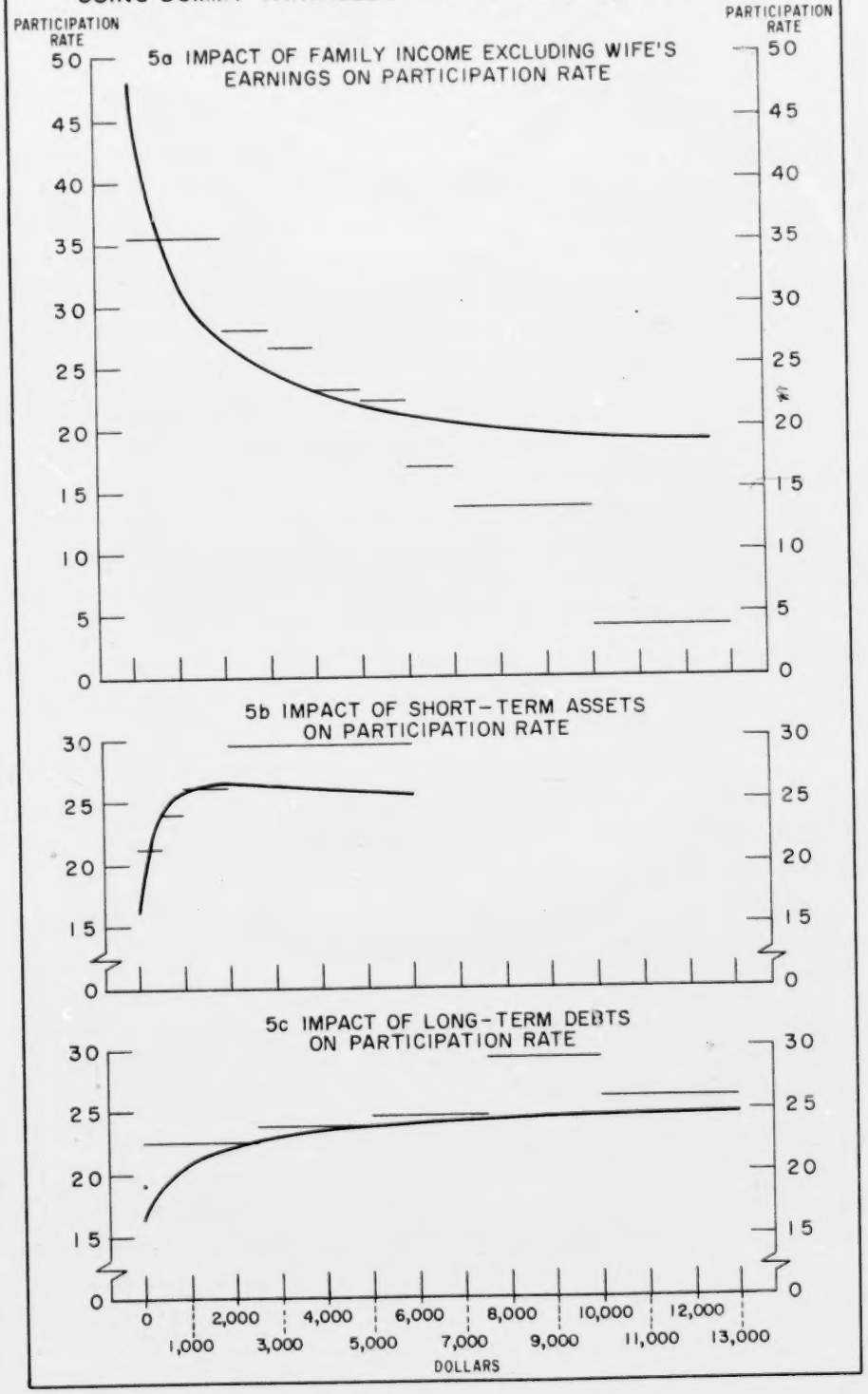
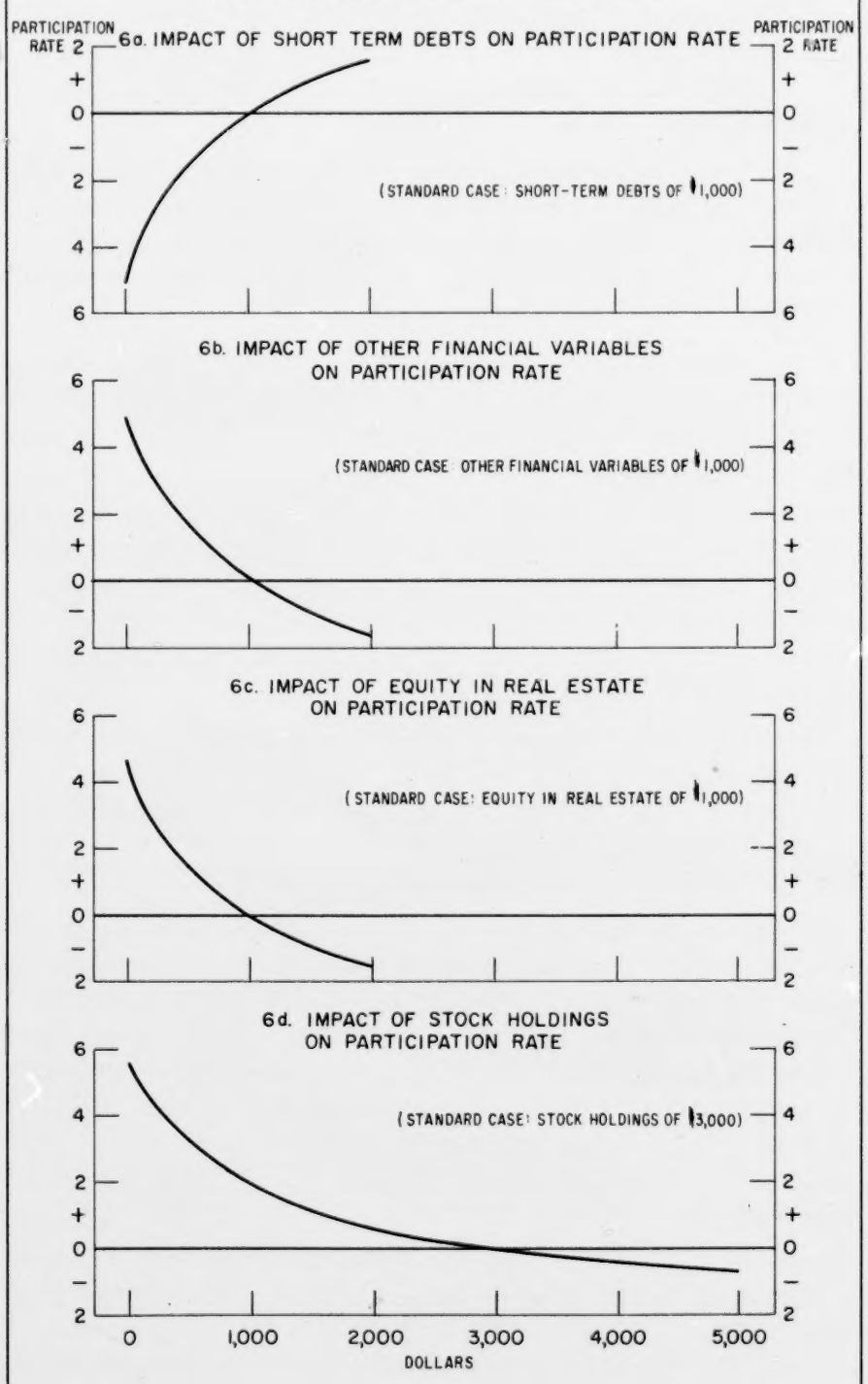


CHART – 6

THE ESTIMATED IMPACT OF VARIOUS FINANCIAL VARIABLES ON THE LABOUR FORCE PARTICIPATION OF MARRIED WOMEN: THE CONTINUOUS VARIABLE CASE



The Separate Age Groups

The results for the separate age groups, as indicated by the regression coefficient estimates tabulated in Table 18, are largely consistent with those discussed earlier in connection with partly continuous variable analysis. We therefore do not make detailed comparisons. Instead we comment on the ranking of the "importance factors" reported in Table 17 – something which was not possible in the earlier analysis.

Clearly the child status variable dominates in the case of married women who have younger children at home. The child status factor ranks number one in each of the separate age groups (under 25, 25-34, and 35-44); it falls to fourth place for women 45-54, and virtually disappears for older women.

On the other hand the family income variable moves from third in importance in the under 25 group, to second in the 25-34 and 35-44 groups, and becomes the dominating factor for older women.

The relative positioning of most other variables does not appear to provide a stable pattern. In part this is because the several categories of asset holdings are rather close substitutes or, in any event, have beta coefficients of similar magnitudes, such that their rank ordering is of little consequence.

Households in Metropolitan Areas

Seven regression equations similar to those for all households (except for the metro-dummy variable which, of course, was dropped) were estimated using the 2,858 metropolitan households. The resulting beta coefficients and regression coefficients for the five most important variables are given in Tables 20 and 21, respectively.

Once again the strong beta coefficient for the age of wife factor justifies the use of the six age regressions to shed further light on the participation of the wife in the labour force. A study of the table of beta coefficients revealed that the same five factors as in the all-household case were the most important ones here also. However, there were some notable differences in both the sign and magnitude of some of the dummy variables.

The Five Factors

There are no important sign or coefficient differences for any of the dummy variables for the **child status** factor in the metropolitan household compared to the all-household regressions. For the second factor, **family income less the wife's earnings**, the metropolitan household regressions

showed a somewhat irregular pattern of large positive coefficients associated with small income declining to large negative coefficients for large income. In five of the six age regressions the coefficient for the zero income dummy variable was larger for the metropolitan households suggesting that there is a stronger incentive for the wife in a low-income family to work when the family lives in a metropolitan area.

TABLE 19. Comparison of the Participation Rates of Married Women in the Atlantic Region

Age of wife	All	Metropolitan
Under 25 years	4.55	- 4.02
25 - 34 years	- 4.81	- 11.08
35 - 44 "	- 2.44	- 11.09
45 - 54 "	- 7.07	- 18.88
55 - 64 "	- 14.59	- 19.05
65 years and over	5.68	9.29

Source: Regression coefficients, Tables 18 and 21.

TABLE 20. Beta Coefficients Calculated from the Dummy Variable Regressions, Metropolitan Areas

Factor	Age group						
	All ages	Less than 25	25 - 34	35 - 44	45 - 54	55 - 64	65 years and over
Child status	.344	.379	.320	.311	.133	.041	--
Family income	.224	.226	.226	.241	.240	.367	.277
Liquid assets	.119	.156	.129	.115	.104	.232	.149
Region	.118	.094	.123	.136	.188	.186	.082
Long-term debt	.086	.235	.133	.057	.103	.052	.302
Equity	.087	.220	.121	.071	.152	.161	.165
Short-term debt	.064	.098	.090	.079	.146	.127	.313
Stocks	.039	.148	.056	.060	.101	.148	.141
Other financial assets	.048	.041	.067	.106	.084	.127	.108
Adults	.102	.091	.103	.028	.074	.074	.079
Head self employed	.047	.116	.005	.104	.028	.040	.132
Head unemployed	.010	.003	.002	.005	.006	.045	.082
Age of wife	.322						

TABLE 21. Dummy Variable Analysis of the Labour Force Participation of Married Women, Metropolitan Areas, Canada

Variable group	Age groups		
	All ages	Less than 25	25-34
Mean of dependent variable	24.2	33.7	22.3
Family income less wife's earnings:			
$ 0-$1,999	19.6	22.1	2.4
2,000- 2,999	9.7	.9	16.5
3,000- 3,999	9.0	4.3	11.4
4,000- 4,999	3.6	5.2	2.8
5,000- 5,999	0.5	- 12.8	4.
6,000- 6,999	- 4.0	- 1.8	- 11.
7,000- 9,999	- 6.8	- 26.5	- 11.5
10,000+	- 18.2	- 3.8	- 15.5
Child status:			
No children	16.8	25.5	34.0
All children less than 6 years	- 17.4	- 12.3	- 5.0
All children aged 6-14 years	3.9		9.5
All children aged 15-16 years	8.2		
All children aged 17-19 years	14.3		
Children less than 6 plus other children	- 17.8	- 15.8	- 7.9
All children 6 years or older	0.6		
Region of residence:			
Atlantic Provinces	- 9.7	- 4.0	- 11.1
Quebec	- 5.8	- 5.8	- 4.6
Ontario	4.1	4.9	3.8
Prairie Provinces	5.2	1.1	7.2
British Columbia	- 0.3	- 0.1	- 2.1
Liquid assets:			
$ 0	- 9.0	- 6.8	- 8.8
1-$ 499	- 0.3	- 0.7	0.3
500- 999	1.3	8.7	6.0
1,000- 1,999	4.3	11.2	8.3
2,000+	8.6	35.3	5.6
Long-term debts:			
$ 0	- 2.5	- 4.7	- 3.7
1-$2,499	1.5	2.0	- 5.3
2,500- 4,999	5.1	18.0	10.7
5,000- 7,499	1.4	37.0	- 0.5
7,500- 9,999	7.8	31.2	8.1
10,000+	5.5	18.6	8.3
Age of wife:			
Less than 25 years	11.7		
25-34 years	10.8		
35-44 "	6.3		
45-54 "	- 4.5		
55-64 "	- 19.6		
65 years and over	- 37.0		
$\bar{R}^2$	.16	.18	.16

TABLE 21. Dummy Variable Analysis of the Labour Force Participation of Married Women, Metropolitan Areas, Canada – Concluded

Variable group	Age groups			
	35-44	45-54	55-64	65 and over
Mean of dependent variable	27.1	28.0	18.3	2.7
Family income less wife's earnings:				
$ 0-$1,999	45.9	26.3	21.7	2.8
2,000- 2,999	12.6	8.8	15.7	3.2
3,000- 3,999	10.2	8.1	13.5	- 1.8
4,000- 4,999	2.0	11.1	- 9.0	- 3.3
5,000- 5,999	- 0.7	0.0	4.3	8.1
6,000- 6,999	3.7	0.4	- 11.1	- 5.0
7,000- 9,999	- 5.3	- 2.0	2.4	- 3.9
10,000+	- 17.1	- 17.9	- 18.8	- 7.2
Child status:				
No children	17.7	4.3	- 0.5	
All children less than 6 years	- 13.7			
All children aged 6-14 years.....	2.4	- 1.4		
All children aged 15-16 years.....	15.8	8.8		
All children aged 17-19 years.....	37.1	3.3	4.2	
Children less than 6 plus other children	- 15.8	- 16.7		
All children 6 years or older	7.6	- 6.7	- 2.3	
Region of residence:				
Atlantic Provinces.....	- 11.1	- 18.9	- 19.1	9.3
Quebec.....	- 6.3	- 8.4	- 7.3	4.0
Ontario.....	5.6	3.6	6.4	- 1.7
Prairie Provinces.....	5.7	12.6	2.9	- 2.7
British Columbia	- 4.1	1.9	1.5	- 1.3
Liquid assets:				
$ 0	- 8.7	- 7.1	- 10.2	- 2.1
1-$ 499	3.0	- 0.4	- 10.2	- 1.7
500- 999	- 4.1	- 3.5	10.3	- 3.0
1,000- 1,999	- 1.2	1.2	3.0	1.3
2,000+	9.3	9.2	9.4	2.9
Long-term debts:				
$ 0	- 2.0	- 2.9	- 0.0	- 0.7
1-$2,499	- 2.5	0.9	- 1.9	3.4
2,500- 4,999	1.1	10.2	1.6	- 6.4
5,000- 7,499	2.7	- 1.0	- 8.0	- 0.3
7,500- 9,999	5.6	- 0.9	3.5	14.2
10,000+	1.0	7.9	2.2	38.9
Age of wife:				
Less than 25 years.....				
25-34 years				
35-44 "				
45-54 "				
55-64 "				
65 years and over.....				
$\bar{R}^2$	.18	.08	.07	.11

The third factor, **liquid assets,** once again reveals a rough positive relationship between these assets and the probability of the wife being in the labour force. While a few of the signs and magnitudes of the dummy variables are different from the all-household regression the direction of the correlation is quite clearly the same. Again we note that this result is consistent with the continuous variable analysis over relatively low levels of liquid asset holdings. The important difference is that the higher dollar values for the dummy variable categories were not further subdivided and hence they do not pick up the downturn which appears to hold with respect to the impact of assets on the wife's participation.

The fourth factor is **region of residence** and the only occurrence of sign and magnitude changes was for the variable representing the Atlantic provinces for each of the age categories. The coefficients from the metropolitan and all-household regressions for this variable are reported in Table 19. Except for the oldest age category, there is a stronger likelihood that a wife in the Atlantic provinces will not be in the labour force if she lives in a metropolitan area than elsewhere. Furthermore, while the typical Atlantic provinces wife, aged under 25 is more likely to be in the labour force than the typical Canadian wife in the same age bracket, this likelihood is reversed if the Atlantic household is in a metropolitan area. On the other hand, the likelihood of a wife of age 65 or more being in the labour force is greater than average in the Atlantic provinces and still greater if her household is in a metropolitan area.

The fifth factor, **long-term debts,** once again reveals a rough positive relationship between these debts and the probability of the wife being in the labour force. The overall strength of this factor is weak.

Concluding Comments on the Use of Dummy Variables Rather than Continuous Variables in Regression Analysis

There are advantages and disadvantages associated with the use of continuous variables vis-a-vis dummy variables in the analysis of survey and other data.

On the plus side for continuous variables we find that they are typically decidedly easier to use since most computer programmes for the analysis of data work directly with continuous values. Also on the plus side is the widespread use of continuous variables in regression analysis. If the values enter the relationship linearly this means that there exists a wide audience with whom communication is a simple matter.

The major offsetting disadvantage associated with the use of continuous variables is that the functional form of the regression equation

has to be specified in advance. Furthermore, if nonlinear relationships are specified the results can become rather more complex to interpret, and communication is thus impaired.

If one uses dummy variables the regression analysis itself requires no further specification of the form of the equation (beyond setting ranges for each dummy variable category): the functional form (e.g., linear or nonlinear) which best fits the data will be provided as part of the results. Furthermore, the results are relatively easy to interpret, especially when compared to nonlinear continuous variables.

Regarding the disadvantages associated with the use of dummy variables, it is true that most "package" computer programmes will not automatically convert the continuous values to dummy variables. Furthermore, once the results have been obtained the beta coefficients must be calculated. Nonetheless, these disadvantages must not be overemphasized since all the computer aspects of the analysis could readily be integrated.

In our particular application of both continuous variable and dummy variable regression analysis we see no strong advantage for one over the other. However, the dummy variable would have had a decided advantage over a **linear** continuous variable specification of the model.

IX. CONCLUSIONS

It is clear that in the post-war period married women in Canada have entered the labour force in increasingly great measure. The extent of the increase in their labour force participation has been rather well documented. Only recently, however, have researchers in Canada begun to look seriously at the substantial change in the labour force behaviour of this particular group, and made an attempt to understand it. Our study is one of those attempts – in fact, the fourth which focuses directly on the question why married women in Canada work.

In our investigation we have as a starting point the previous studies, and the accumulation of knowledge which they represent. They have served to distinguish income, child status, age of the wife, and education of the wife as factors influencing in an important way the decision of a married woman to be in the labour force. Ideally we would like to pick up from that point, incorporate in our analysis these several factors and proceed to consider the apparent role of still more. This we do to the extent that it is possible, but we have no information on one of the very important explanations of the labour force participation of the married woman – namely, her education. However, with that one chink in our armour we do proceed to add to the factors already established as significant determinants of the labour force participation of the married woman several others, and to investigate the role which they play.

Our basic finding is that by using observations on a cross section of the population we are able to isolate several factors which have a significant role in determining the labour force participation of married women in general, and which collectively account for much of their labour force behaviour.

We first consider the variables which have been emphasized in previous studies (income, child status, region of residence) and then those which we have added (family, holdings of assets and debts, labour force status of the husband, presence of other adults in the family, and residence in a metropolitan area).

Income

There is clear and convincing evidence that a married woman is less likely to be in the labour force the higher the level of family income available, exclusive of her earnings. In our analysis we have suggested that a plausible assumption regarding the relationship would be that while an additional unit of income would decrease the probability that a married woman would be in the labour force, such a change would have a smaller

impact on her labour force participation the higher the level of income when the change occurred. This assumption is well supported by the evidence.

We also find that the relative weighting of the income factor in a wife's labour force decision varies systematically with her age, and more particularly, with her child status: income is an increasingly important element in determining a wife's labour force participation, the older she is, and hence the more rare the instances of having pre-school children in the family.

Child Status

For married women in the several age groups for which the presence of pre-school children is a common occurrence (i.e., less than 25, 25-34 and 35-44) the child status factor clearly dominates her labour force participation considerations. Consistent with prior evidence, the presence of a pre-school child is a very strong deterrent to the mother's labour force participation. We have extended the previous investigations of the importance of various child status possibilities to consider seven distinct and exhaustive possibilities. In addition to confirming the importance of the presence of young children, we find their presence whether alone or in the company of older children to be about equally strong deterrents: older children apparently do not serve a child-care role to the extent that they free the mother for the labour force. We also find that when children from only one of our age groups is present the mother is more likely to be in the labour force the older the children.

Region of Residence

Attitudes, religious background, educational background, fertility patterns, and the climate, among other things, vary greatly from one part of Canada to another. By including in our analysis a variable to capture the average influence of these many components of regional differences we learn whether residence in any particular region of Canada tends, on balance, to discourage or encourage the labour force participation of the married women living there.

We do find a significant regional affect on labour force participation which apparently holds independent of the several other influences which we have considered directly. Residence in Quebec, the Atlantic provinces and, to a lesser extent, British Columbia tend to discourage the labour force participation of married women whereas residence in Ontario or the Prairie provinces is an encouraging influence. There is an interesting age

dimension to the regional differences: for the youngest group of married women the region of residence is not a significant influence, but for older women it becomes increasingly significant.

Asset and Debt Holdings

We find that, as expected, while holding other influences constant, the greater the stock of assets which the family could draw upon in an emergency, the less the probability that the wife will be in the labour force. While the influence of asset holdings is a significant influence on the labour force participation of a married woman, it is not a terribly strong influence.

On the other hand, other things constant, the greater the value of debts incurred by the family the more likely the wife is to be in the labour force. Again, while the influence is statistically significant, and in the expected direction, it is a rather weak influence.

It should be noted that our findings are inconsistent with the hypothesis that married women enter the labour force in order to accumulate assets or to incur debts.

The age pattern of the impact of the asset and debt holdings suggests that their prime impact tends to be on women whose children have reached school age: once relatively free for labour force participation rather greater weight is given to the family's financial security position than was deemed possible earlier.

Labour Force Status of Husband

Our evidence suggests that consistent with expectations, a wife is much more likely to be in the labour force if a husband is unemployed than if he is employed. Furthermore, she is less likely to be in the labour force if he is self-employed than if he is employed.

The strength of the influence of the employment status of the husband is clearly substantial for wives who typically have no pre-school children. For women in the younger age groups the employment status of the husband is clearly a secondary consideration, and her child status position dominates her labour force behaviour.

Presence of "Extra" Adults in Family

The presence in the family of an adult other than the husband and the wife could encourage the labour force participation of the wife either by providing a built-in babysitting service or simply by placing greater demands on the family's resources. On the other hand such a person could

discourage her participation by himself requiring attention. Thus it is not clear what impact the presence of an extra adult in the family will have on the labour force participation of the wife.

Our conclusion is that on balance, the presence of such a person encourages the labour force participation of the wife.

Residence in a Metropolitan Centre

Just as attitudes, including those towards the labour force participation of married women, and circumstances vary from region to region, they vary with the size of the centre in which the family lives. Our analysis supports strongly the hypothesis that a married woman is more likely to work the larger the centre in which she resides. Of course, it may not be sheer size which accounts for the differential, but rather differences in fertility rates and patterns (women in larger centres tend to have fewer children) and in the availability of suitable employment opportunities.

Concluding Comments

While the present study has carried us some distance in understanding why married women work – and why they do not – there are many as yet unexplored possibilities which warrant study. Among these is an investigation of many of the "taste" factors which we have subsumed in the catch-all categories of region of residence and size of centre of residence. There are differences here on which one could focus – for example, religion, education, and fertility patterns – and which could well yield rather more precise information.

In addition it would be a useful, exciting, and interesting exercise to turn the analysis on its head and ask what impact the various economic and other influences on which we have been focusing have on the fertility rates and patterns of married women in Canada.

APPENDIX A

Variable Names and Definitions

Variable name	Variable definition
Income:	
$Y_f - W$	Total before-tax family income, from all sources, for the calendar year 1963, excluding earnings of the wife. The total income of the family is the sum of (a) wages and salaries; (b) military pay and allowances; (c) net income from self-employment, business or profession; (d) gross income from roomers and boarders; (e) bond interest and bank interest from deposits; (f) dividends; (g) other income from investments; (h) family allowances; (i) old age pensions; (j) other income from a government source; (k) retirement pensions, superannuation and annuities; (l) other money income. The earnings of the wife are the total of items (a) and (c) attributed to her.
Debts:	
D_{st}	Short-term debts of the family as of the survey week.[44] The entry includes all non-mortgage debt of the family. Specifically it is the sum of consumer debt: (a) charge accounts; (b) instalment debts; (c) to small loan companies; (d) to credit unions and cooperatives; (e) loans from chartered banks secured by collateral such as cash surrender value of life insurance and automobiles; and (f) other loans from chartered banks. Plus other debt: (a) loans from chartered banks secured by stocks and bonds as collateral; (b) home improvement loans from chartered banks;

[44] The survey week was in March and April of 1964.

APPENDIX A – Concluded

Variable Names and Definitions – Concluded

Variable name	Variable definition
Debts – Concluded:	(c) all loans not otherwise specified; (d) hospital, doctor and dental debts; (e) debts to other persons; (f) other debts.
D_{lt}	Long-term debts of the family as of the survey week. It is this total mortgage debt on all real estate.
Assets:	
A_{st}	Liquid assets of the family as of the survey week. This item is the sum of: (a) current account (including personal chequing account) with chartered banks; (b) savings accounts with chartered banks; (c) other deposits; (d) Canada Savings Bonds; (e) other Government of Canada bonds; (f) all other bonds.
S	Value of all stocks owned by the family as of the survey week. This item is the sum of: (a) market value of publicly-traded stocks; (b) value of investment in investment club; (c) value of investment in mutual fund; (d) value of stocks in trust or estate.
OF	Value of other financial assets owned by the family of the survey week. This item is the sum of: (a) principal owing on mortgages or agreements of sale; (b) loans to other persons.
EQ	Value of family equity in real estate as of survey week. This item is: (a) the estimated (by respondent) value of his dwelling if owned; (b) the estimated (by respondent) value of property held for investment purposes or for rent to other people or businesses; (c) less mortgage debt outstanding on (a) and (b).

APPENDIX B

Elasticity Measures and Calculations

The figures in Table 12 are the **elasticity** measures implied by the regression analysis. In each case the calculation suggests the percentage change in the labour force participation rates of the married women which will result from a one per cent increase in the level of each of the several explanatory variables when the other explanatory variables are valued at their observed means. The figures have the advantage of being unit free, and thus the absolute magnitudes may be compared. The formulae used in these calculations are:

(1) for Y_f - W, St D, Lt D, Stock, OFA, and Equity:

$$\eta_i = -\frac{\partial p}{\partial X_i} \cdot \frac{\overline{X}_i}{p_o} = b_i \left(\frac{1000}{\overline{X}_i + 1000}\right)^2 \frac{\overline{X}_i}{p_o} \cdot \frac{1}{1000}$$

(2) for liquid assets:

$$\eta = -\frac{\partial p}{\partial X_i} \cdot \frac{\overline{X}_i}{p_o} = b_4 \left(\frac{1000}{\overline{X}_4 + 1000}\right)^2 \frac{\overline{X}_4}{p_o} \cdot \frac{1}{1000} + 2b_5 \left(\frac{1000}{\overline{X}_4 + 1000}\right)^3 \cdot \frac{\overline{X}_4}{p_o} \cdot \frac{1}{1000}$$

where p is the participation rate

p_o is the predicted participation rate when the variables are valued at the actual means

x_i refers to the specific explanatory variable. E.G., X_1 is family income, excluding the earnings of the wife, i.e. $Y_f - W$.

$\overline{X}_i$, the mean value of the i^{th} variable.

b_i the regression coefficient attaching to the i^{th} variable in Table 10.

TABLE B-1. Mean Dollar Values of Continuous Variables in the Sample

Variable	Age group						
	All ages	Less than 25	25-34	35-44	45-54	55-64	65 and over
$Y_f - W$	5,750	4,052	5,414	6,351	6,682	5,955	4,488
D_{st}	735	825	883	829	881	397	128
D_{lt}	2,861	1,500	3,391	3,662	3,309	1,795	639
A_{st}	2,246	703	1,020	1,543	2,750	4,526	6,447
S	1,657	658	308	1,385	3,047	2,215	4,206
OF	439	14	203	282	766	777	1,052
EQ	7,962	1,559	5,721	7,311	12,005	11,313	11,589

Source: Unpublished **SCF64** tabulation.

APPENDIX C

Dummy Variable Regression Analysis: Some Technical Aspects

A regression equation with all the independent and the dependent variables represented by dummy variables is called a linear probability function with the expected value of the dependent variable being a linear function of the independent variables. There are several aspects of dummy variable regression analysis, in addition to the relative freedom in the specification of the relationship which was discussed in the text, which we now consider.

Constraints and their interpretation

Recall the basic functional form

$$p_i = a_1 f_{i_1} + a_2 f_{i_2} + \ldots + a_j f_{i_j} + \ldots + a_n f_{i_n} + a_o + \epsilon_i$$

where p_i is a dummy variable with unity indicating the participation of the wife of the i^{th} family in the labour force, the f_{i_j} is the j^{th} factor for the i^{th} family which is assumed to influence the labour force participation of the wife, the a_i is the coefficient indicating the importance associated with this factor and a_o is the constant term. The ϵ_i is an error term representing random, unexplained factors. This is a simple additive model with n factors and no interactions.

If each of the factors is represented by a sub-group of dummy variables then the j^{th} factor, say, in the regression equation becomes

$$\beta_1 X_1^{(j)} + \beta_2 X_2^{(j)} + \ldots + \beta_k X_k^{(j)}$$

where $X_1^{(j)}$ is a dummy variable for the first sub-group selected for the basic variable and has a value of 1 if the sub-group condition is met and a value of 0 otherwise, while β_1 is the regression coefficient related to this variable. Similarly for $\beta_2 X_2^{(j)}, \ldots, \beta_k X_k^{(j)}$.

For example, we can define 5 sub-groups for the value of short-term debt (assume it is the 3rd factor) held by a given family as

$X_1^{(3)} = \begin{cases} 1 \text{ when actual value is 0} \\ 0 \text{ otherwise} \end{cases}$

$X_2^{(3)} = \begin{cases} 1 \text{ when actual value is in interval \$1 to \$999} \\ 0 \text{ otherwise} \end{cases}$

$X_3^{(3)} = \begin{cases} 1 \text{ when actual value is in interval \$1,000 to \$1,999} \\ 0 \text{ otherwise} \end{cases}$

$X_4^{(3)} = \begin{cases} 1 \text{ when actual value is in interval \$2,000 to \$4,999} \\ 0 \text{ otherwise} \end{cases}$

APPENDIX C – Continued

$X_5^{(3)} = \begin{cases} 1 \text{ when actual value is greater than \$5,000} \\ 0 \text{ otherwise} \end{cases}$

Thus, in the regression equation, the value of the short-term debt will be represented by

$$\beta_1 X_1^{(3)} + \beta_2 X_2^{(3)} + \beta_3 X_3^{(3)} + \beta_4 X_4^{(3)} + \beta_5 X_5^{(3)} \qquad [1]$$

When a factor is represented by a sub-group of dummy variables in the above fashion it is clear that by adding the sub-groups to one another we will have linear combination of variables that totals to unity. However, our regression equation has a constant term which requires the allocation of a "1" in the data array for each family. Thus, we are unable to estimate uniquely the regression coefficients for this equation since the exact linear relation between the dummy variables and the constant term will result in a singular sums of squares and cross-products matrix.

A solution to the problem is to place sufficient constraints on the values which the terms in the equation can take so that matrix inversion can take place. Mathematically, this means that we are estimating differences between contributions of the various sub-groups of a factor rather than the direct contribution of these sub-groups. There are at least three different constraining techniques that can be employed. In each case, however, we are reparameterizing the basic model for estimation purposes.

First, we can constrain the constant term to be 0. Thus, in equation (1) the coefficients $\beta_1, \ldots, \beta_5$ are measures of the influence of $X_1^{(3)}, \ldots, X_5^{(3)}$ as deviations from 0.

Second, we can arbitrarily select one of the sub-group coefficients and constrain it to be 0. In this case, the coefficient estimates $\beta_2, \ldots, \beta_5$ measure the expected difference that $X_2^{(3)}, \ldots, X_5^{(3)}$ have on the dependent variable, as compared to the omitted $X_1^{(3)}$. That is, the constant term in the equation represents the intercept for $X_1^{(3)}$ and $\beta_2, \ldots, \beta_5$ indicate the deviations from the base β_1.

Third, we can constrain the weighted sum of the regression coefficients to 0. It can be shown that in this case the constant term is equal to the mean value of the dependent variable. The estimation procedure yields expected differences of $X_1^{(3)}, \ldots, X_5^{(3)}$ from the average value of the dependent variable (constant term) which is the overall participation rate of the wives in the sample.

With these three techniques available the question arises as to which one to choose for the analysis. Each of the three methods is relatively easy to incorporate into computer regression programmes. Furthermore, it is possible to estimate the regression coefficients using one of the con-

APPENDIX C – Continued

straining methods and to employ a linear transformation to yield coefficients satisfying any of the other two constraints. Having these common features it appears that the most desirable constraining technique is that one which permits the most meaningful interpretation of the reparameterized coefficient estimates. In the present case where we represent all of the factors by dummy variables and where we are interested in the overall effect of the factors on labour force participation rates of married women, the third technique is clearly the preferred one.

Significance and Importance

In a multiple linear regression equation based on continuous data there are two frequently used tests of significance on the coefficient estimates. One is the t-test which is used to test whether a given coefficient estimate is significantly different from zero while the other is the F-test which is used to test whether a group of coefficient estimates is significantly different from zero. However, there are several problems in applying the former to coefficient estimates in an equation with dummy variables used for both the dependent and independent variables. From a technical viewpoint, as will be discussed later, there is the problem of heteroscedasticity. On the other hand, there are some limitations in interpreting the results of the testing procedure. For instance, if the constraint chosen is to restrict one coefficient of the class to zero then the application of this test to a non-constrained coefficient would be to test for the significance of the difference between that class and the omitted class. There would be many such tests depending on the class that was chosen to be constrained to zero. Or consider the constraint where the weighted sum of the coefficients is zero. Here, the t-test for a significant difference from zero is really a test for a significant difference between the overall mean and the coefficient. This implies that a coefficient could be called "insignificant" if its value happened to be near this mean.

A test of more interest is that between various pairs of non-constrained coefficients within a factor group. However, complications arise in this significance test if stratification and/or clustering are employed in the design of the sample. These complications can be minimized to facilitate significance testing but in the use of dummy variable regression analysis it is generally held that measures of importance are more important than measures of significance.

One measure of the importance of a factor is to calculate the R^2 for an equation that includes only the sub-groups of one factor. This procedure is performed for each factor and the end result is a comparison of the gross influences of each factor. However, this technique does not indicate the importance of a factor in an equation with all the factors present.

APPENDIX C – Continued

Another measure of the importance of a factor is the partial R^2. This calculation measures the relative net contribution of a factor to the total explanation by all the factors in the equation. If factor D were added to an equation that already contains factors A, B and C then the partial R^2 is

$$\frac{R^2_D - R^2_{A,B,C}}{1 - R^2_{A,B,C}}$$

The statistical significance of this net contribution of a factor can be tested. However, the calculation of the partial R^2 for each factor in an equation containing many factors may be very expensive in terms of computer time since the easiest way to calculate these values is to estimate the equation as many times as there are factors but each time omitting one of the factors.

There is a third measure of the importance of a factor and this is the one we have chosen to use. This measure is the **beta coefficient**[45] for a set of dummy variables and is analogous to the beta coefficient of multiple correlation in an ordinary multiple regression using numerical variables. The formula for the beta coefficient for factor s having L dummy variables is

$$\beta_s = \frac{1}{\sigma_y} \cdot \sqrt{\frac{\sum_{i=1}^{L} N_i \alpha_i^2}{\sum_{i=1}^{L} N_i}}$$

where α_i is the regression coefficient for the i^{th} dummy variable, N_i is the number of ones for the i^{th} dummy variable and σ_y is the standard error of the dependent variable. This formula assumes that each dummy variable is estimated, i.e., none of the dummies are still constrained to zero.

Heteroscedasticity

The assumptions for the valid use of classical least squares requires that the error term has a constant variance. Since the dependent variable in this case is binary this assumption is not met. To show this fact, let the model be represented as $Y = X\beta + e$, where Y is an $n \times 1$ vector for the dependent variable, X is an $n \times k$ matrix of dummy variable observations,

[45] See, J.N. Morgan, M. David, W. Cohen, and H. Brazer, *Income and Wealth in the United States*, (New York, 1962).

APPENDIX C – Continued

β is a $k \times 1$ coefficient vector and e is an $n \times 1$ error term vector. If $Y_i = X_i\beta + e_i$ is the i^{th} family then $e_i = 1 - X_i\beta$ or $-X_i$ depending on the value of Y_i. If $E(e_i) = 0$, then the distribution of e_i, given X_i, is

e_i	$p(e_i)$
$-X_i\beta$	$1-X_i\beta$
$1-X_i\beta$	$X_i\beta$

The variance of e_i is

$$\text{var}\,(e_i) = (-X_i\beta)^2(1-X_i\beta) + (1-X_i\beta)^2(X_i\beta)$$

$$= (1-X_i\beta)\,(X_i\beta). \qquad [2]$$

Thus, the variance depends on the value of X_i; this condition of varying error disturbances is called heteroscedasticity.

Does the existence of heteroscedastic disturbances affect the properties of the ordinary least squares estimator? It can be shown that the ordinary least squares estimator remains unbiased but that the estimates of the variance-covariance matrix of the estimator are biased and inconsistent. Hence the procedure used in the text gives biased and inconsistent estimates of the standard errors of the estimated regression coefficients.

It cannot be presumed that the standard errors as calculated in the text will be smaller or larger than their true values. However, in a similar regression analysis to explain labour force participation, where there was a dummy dependent variable and nearly 1400 sample observations on individuals, Bowen and Finegan found that there was a "tendency for the approximate standard error estimates to be larger than the more accurate standard error estimates."[46] If we assume that their result is also the case in this study where we have a large number of households, then the effect of the inefficiency is to overestimate the standard errors of the regression coefficients. As a result, all significant coefficients would be even more significant if the model were estimated correctly while some previously insignificant coefficients could become significant.

An alternative solution to the problem caused by heteroscedasticity has been offered by Johnston[47] who suggests that the efficiency of the estimates could be improved by first obtaining the classical least-squares

[46] See, Wm. G. Bowen, and T. Finegan, *op. cit.*
[47] See, J. Johnston, *Econometric Methods*, (New York, 1963).

APPENDIX C – Concluded

estimate of β then estimating var (e_i) in equation (2) with this estimate of β and finally re-estimating β by the method of generalized least-squares. However, since we have a relatively large number of observations for each regression equation the gain in efficiency is likely to be quite small. In any event, the procedure would require nearly double the actual number of computations and hence would have been quite expensive.

Still a different approach was adopted for the regression equations where all the factors and the dependent variable are represented by dummy variables. In this case we had to consider not only the inefficiency caused by heteroscedasticity but also the alternative techniques of constraint for estimation purposes, the relative ease of coefficient interpretation, and the interpretation of t-test results for coefficient estimates when both constraints and heteroscedasticity are present. Our preference for the greatest ease in coefficient interpretation dictated our choice of constraint in obtaining the regression estimates. The two problems arising in tests of significance for individual regression coefficients were minimized by employing a measure of importance for the factor as a whole and then selecting, somewhat arbitrarily, the five most important factors.

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APPENDIX D

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